

JANUARY 1, 1949

# AUTOMOTIVE INDUSTRIES

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## IN THIS ISSUE

Significant Developments in Materials Handling  
Its Importance in Automobile Mass Production  
Selection of Equipment for Aircraft Plants  
Preview of the 1949 Exposition

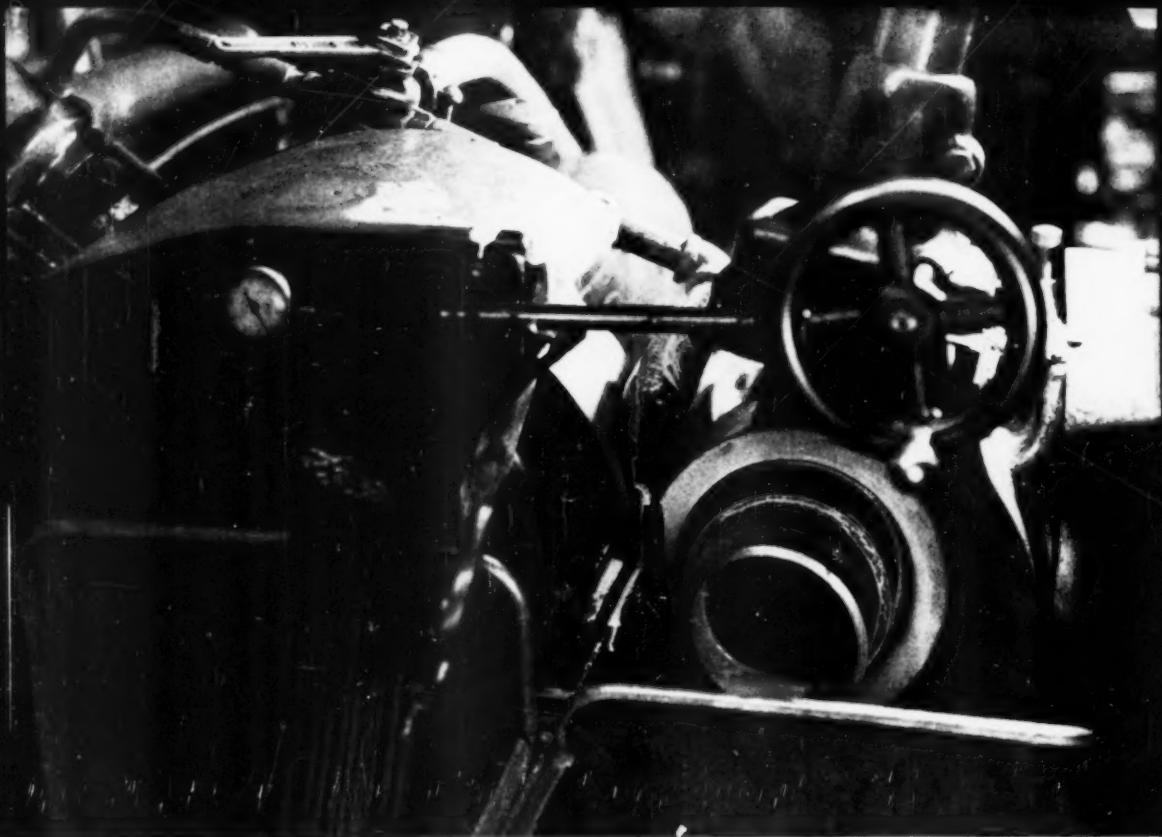
International Screw Thread Standards

Warner Gear Plant Expansion

Productivity Factor in Warplane Design

Complete Table of Contents, Page 3

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## Lands savings on fish pole grinding...

Using a taper grind, a midwest plant makes fishing rods from solid bar stock. Stock removal ranges up to a maximum of .052 inches.

Formerly, production averaged only 100 pieces per wheel dressing. Wheel wear was .045 inches, and wheel dressing removed an additional .025 inches.

At the suggestion of a Standard Cutting Oil Engineer, Stanicool HD Soluble Oil was introduced on this job. Production jumped to 500 pieces per wheel dressing. Wheel wear between dressings was eliminated.

That's *really* landing savings—five times as many pieces, one third as much wheel wear! Fewer dressings and less wear on wheels cut tool costs 20%.

A superior coolant, Stanicool HD Soluble Oil also meets the requirements in many cutting operations. To replace costly cut-

# Stanicool HD Soluble Oil

ting fluids or to improve tool life and production on your machining operations, try "Stanicool HD."

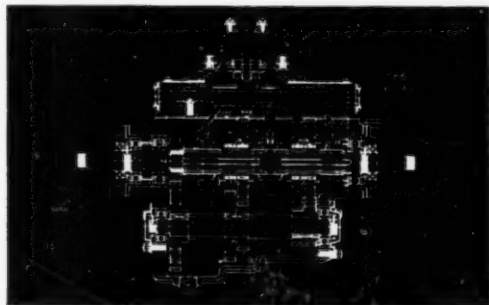
If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Cutting Oil Engineer nearest you.

## STANDARD OIL COMPANY (INDIANA)

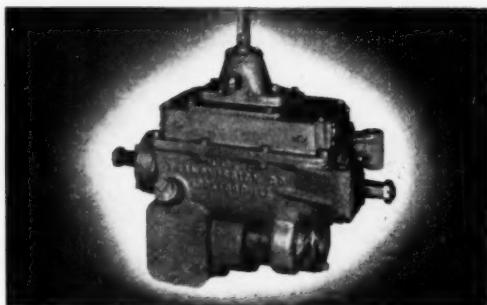


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FOR VERTICAL BOOM DITCHERS MADE BY  
BARBER-GREENE COMPANY, AURORA, ILLINOIS



For Barber-Greene: A special five-speed heavy-duty transmission to give continuous trouble-free performance in the rugged ditcher shown below. Designed by COTTA engineers.



Engineered to order, transmission is constant-mesh, selective-type. Compact unit to fit available space . . . economical in operation, every detail precision-built for gruelling wear.



Powerful but compact, the Barber-Greene Standard Ditcher cuts a ditch from 12" to 24" wide and from surface to 8'3" deep. It will operate in hard coral rock, hardpan to blue clay, sticky gumbo, even in asphalt and macadam pavement. For the special digging transmission, Barber-Greene has been coming to COTTA for over 30 years. Write for catalog.

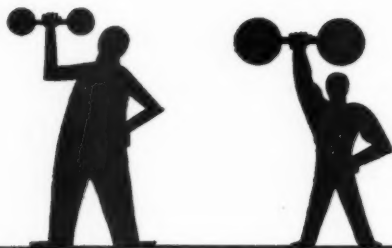
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



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NEW YORK 5, N. Y.



# AUTOMOTIVE INDUSTRIES

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January 1, 1949

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## Contents

High Spots of This Issue	15
News of the Automotive Industries	17
Warner Gear Expands. <i>By Joseph Geschelin</i>	24
International Accord on Unified Screw Thread Standards	26
Equal Emphasis on Producibility Adopted for New Warplane Designs. <i>By Robert McLaren</i>	31
Italian Sports Cars; Containers for Jet Engines	32
Italian V-8 Diesel Power Plant for Buses	33
User's Eye View of the Materials Handling Industry. <i>By E. L. Bailey</i>	34
Aluminum Replacement Fenders for Pontiacs	34
'49 Crosley	35
Significant Developments and Trends in Materials Handling. <i>By Matthew W. Potts</i>	36
A Preview of the Materials Handling Show	37
The Importance of Materials Handling in Mass Production. <i>By Joseph Geschelin</i>	38
Major Factors in Selecting Materials Handling Equipment for Aircraft Plant Operation. <i>By G.E. Musk and J. Nelson</i>	40
Exhibitors at the Third Annual Materials Handling Exposition	42
New Products at the National Materials Handling Show	43
Vane Type Supercharger of Unique Design	51
New Two-Speed Rear Axle	51
New Production and Plant Equipment	52
Aircraft Workers to be in Big Demand in Spring. <i>By Karl Rannells</i>	54
Measuring Thickness of Copper-Nickel Coatings	54
Publications Available	55
Personals	56
Higher Prices in Chevrolet Light and Medium Duty Trucks	56
President's Certificate of Merit Awarded to Wartime Specialists	57
Business in Brief	58
Calendar of Coming Events	68
Advertiser's Index	108

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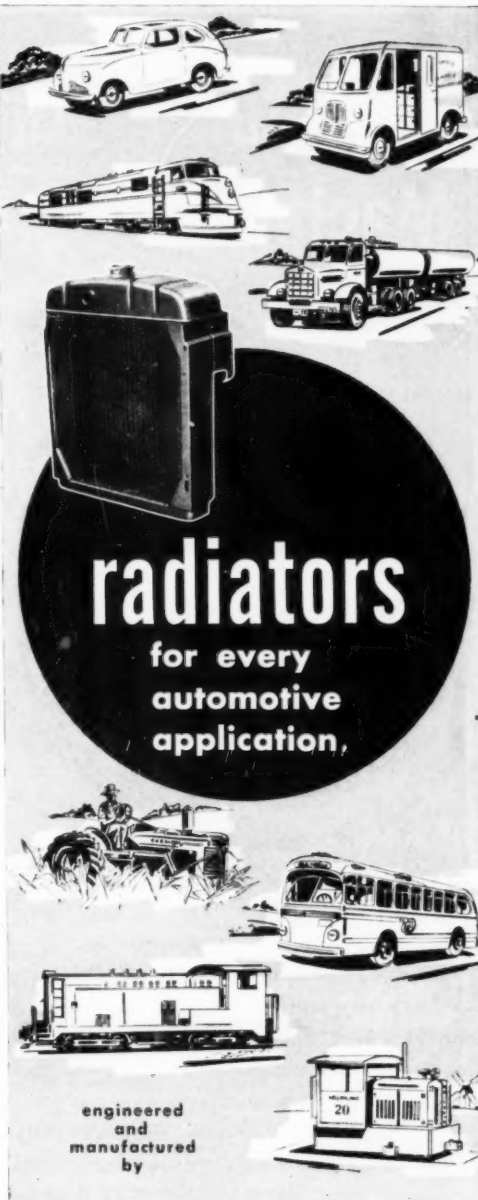
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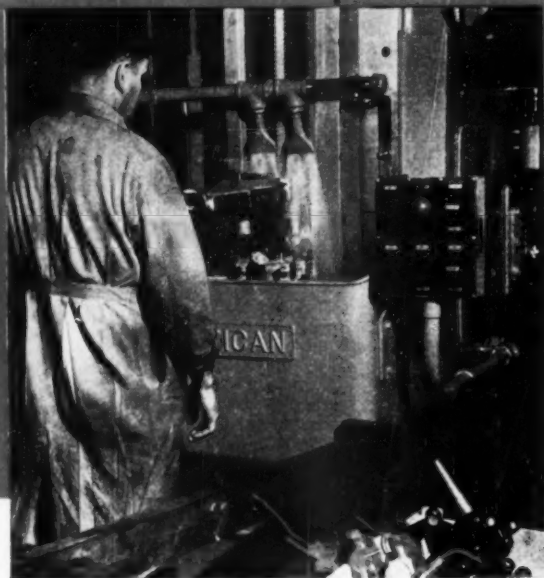
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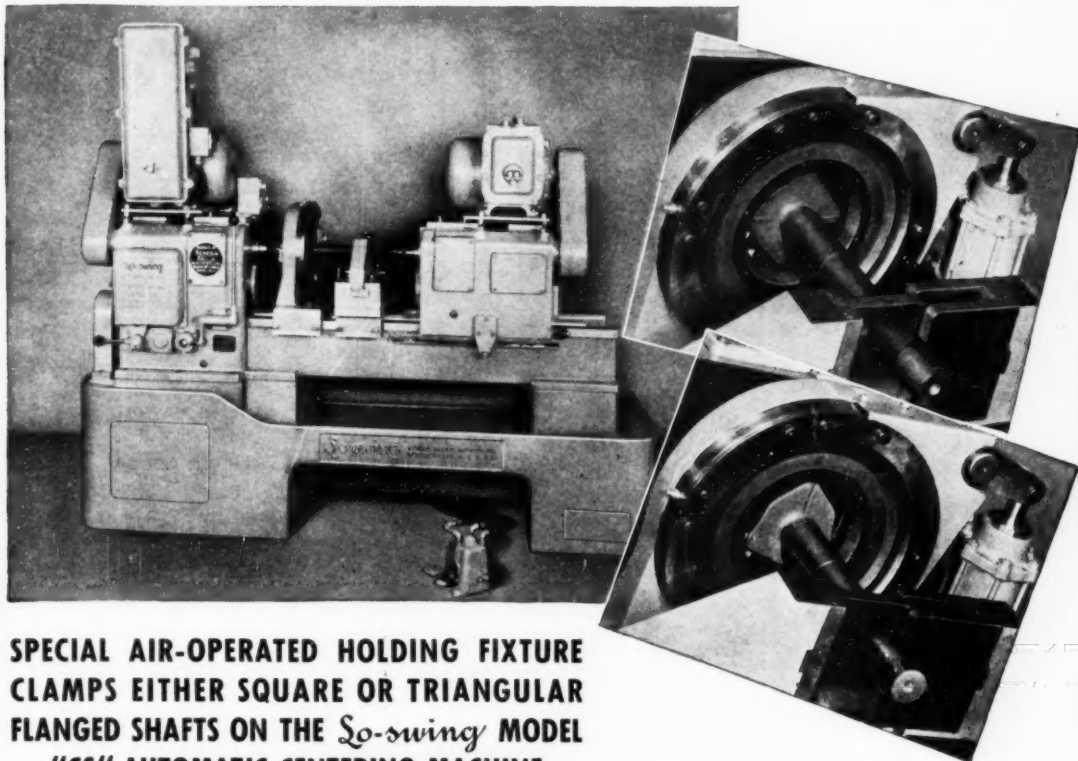


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PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



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**Problem:** To automatically center two types of forgings true with outside surfaces on square and triangular flanged shafts, *without changing holding fixtures.*

**Solution:** The Model "CS" Automatic Drilling and Centering Machine selected for this job, was equipped with an air operated four jaw holding fixture specially designed to clamp either the square or triangular shaped flanged shafts shown in the upper right-hand illustrations. Centering from the outside surfaces of the flanges was important due to subsequent machining operations.

The top illustration shows the clamping of the square flanged shaft with two opposed jaws, while the other two jaws are clear of the work. The stem end of the shaft is held and centered in a standard air operated vise. The lower illustration shows the clamping of the

triangular flanged shaft with three equally spaced jaws while the fourth jaw is clear of the work.

The machine design is 100% mechanical and its operation entirely automatic. The operator simply loads the parts in the holding fixture and steps on the foot control valve which operates both holding fixtures. The machine cycle is started with the lever mounted on the fixed centering head; the drill spindles advance to the work in rapid traverse, slow down for feed and then return to the starting position in rapid traverse.

Both types of shafts have the same overall length and the operator may center either type of shaft as these reach the machine *without making adjustments of any kind.*

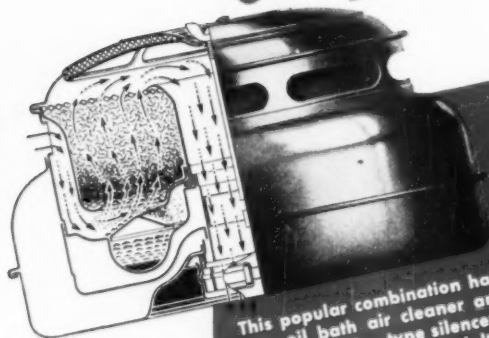
Engineered jobs are our specialty and our staff is at your disposal to assist in solving your problems.

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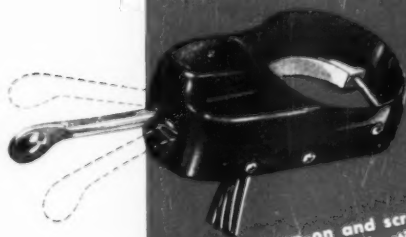
## PRODUCTION COSTS ARE LOWER WITH Lo-swing

# THE AUTOMOTIVE INDUSTRY GIVES EVER-INCREASING RECOGNITION

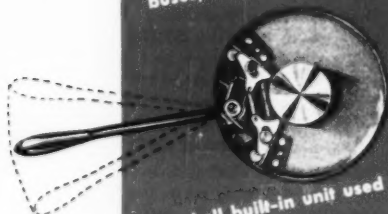
*to these UNITED products*



This popular combination hat type oil bath air cleaner and silencer — bulge type silencer originated by United Specialties Company — is the most copied type now used as standard equipment by independents in the automobile industry.



Mitchell clamp-on and screw type semi-automatic directional signal switch units for cars, buses, trucks, tractors.



Mitchell built-in unit used on passenger cars.

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- Pioneer of special air cleaner designs for passenger cars, trucks, tractors and industrial engines.
- More than 260 models — a size and type for every kind of internal combustion engine.
- United Oil Bath Air Cleaners have over 99 percent dirt-trapping efficiency.
- Over 25 years of close cooperation with automobile designers.

## MITCHELL Semi-Automatic Directional Signal Switch

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- Simple to operate — Lever on steering post controls flashing right or left turn signal.
- 3 signal switch Models — Built-in, clamp-on and screw type units.
- All three types available for installation as original equipment or for field installation in the after market.

United Specialties' 25 years of experience in the automotive, agricultural and industrial power industries is yours to use. Consult our sales engineers on your design application problems.

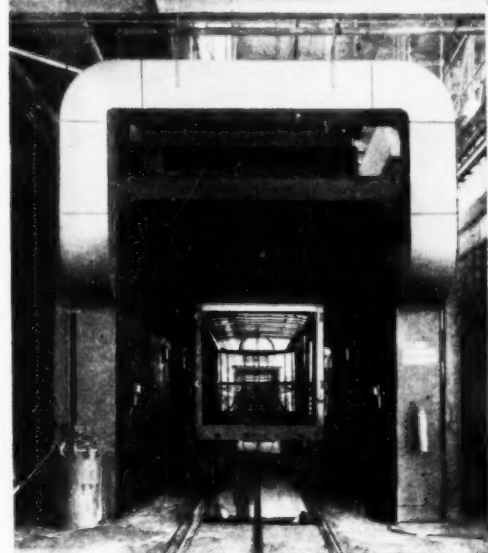
## UNITED SPECIALTIES COMPANY

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## ... Truck-Trailers Too, Receive Their Finish In MAHON Finishing Systems!

The Mahon Finishing System installed in the Fruehauf Trailer Company's new plant at Avon Lake, Ohio, is another excellent example of Mahon Finishing Equipment engineered into a straight line production system to handle completely assembled Truck-Trailers. This complete system in the plant of the world's largest producer of Truck-Trailers, is 1750 feet long and consists of thirteen Hydro-Filter Spray Booths, with Filtered Air Supply, and five Finish Baking Ovens. The prime coating is done on three production lines which converge into two production lines for the finish coat painting and baking operations. If you are contemplating new, modern finishing equipment, remember that Mahon has pioneered development in this highly specialized field for twenty-eight years... this broad experience in every industry, coupled with constant development research, has endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere. Better planning, better engineering, and a better and more economical job of finishing is the result. See Sweet's Mech. Ind. File for complete information.

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Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning Machines, Rust Proofing Machines, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Units, Drying and Baking Ovens, and Paint Reclamation Units. Also Core Ovens, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

The Top Illustration Shows Mahon Hydro-Filter Spray Booths in Three Prime Coat Painting Production Lines in the Fruehauf Trailer Company's New Plant, Avon Lake, Ohio. Bottom Illustration Shows Completely Assembled Chassis and Body Skeleton Framework Receiving Prime Coat of Paint in one of the Spray Booths Illustrated Above.

# MAHON



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Enlargement shows a scored and galled surface of a  $3\frac{1}{2}$ " O.D. bearing that "froze" and failed. Had this surface first been Superfinished, it would have had nearly twice the load-bearing capacity and about three times the life. "Wear and Surface Finish," is a new textbook on Superfinish. Write for it on your company letterhead.

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Hockensmith Corporation, Penn Body Division, of Penn, Pa., puts real meaning in its slogan: "Strength • Service • Economy" by using J&L Jalloy and Otiscoloy steels.

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# EX-CELL-O

Can give you  
more economical  
production



## Special Machine with Trunnion Fixture Combines Operations on Axle Housings

## **Combines Operations on AXLE**

Combining operations is a time-proven method of obtaining more economical production. Shown here is an Ex-Cell-O special machine with a six-station power indexing trunnion type fixture that performs roughing and finishing operations on steel axle housings. Standard hydraulically-actuated slides at both ends of the machine carry multiple spindle heads and their drive motors. Another slide at the rear supports a precision spindle and a facing head.

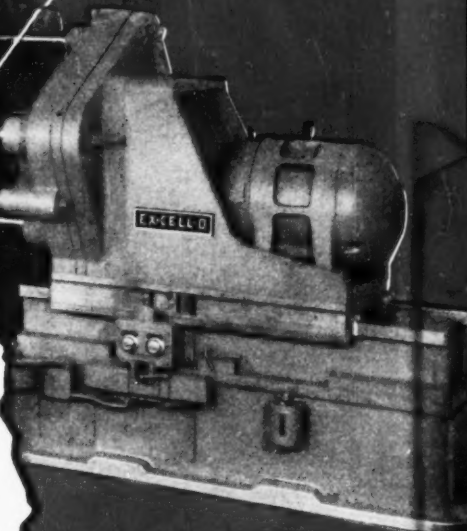
The tool holders in both the multiple spindle heads are rigidly guided by bushings in the fixture end frames. Coolant is manifolded to each station and directed through drilled holes to the point of contact between the tools and work.

Workpieces are laid in the loading station and are located and clamped before being indexed to the next station. The first two stations perform rough, semi-finish bore and rear face flange operations. The last three stations perform finish face flange operations.

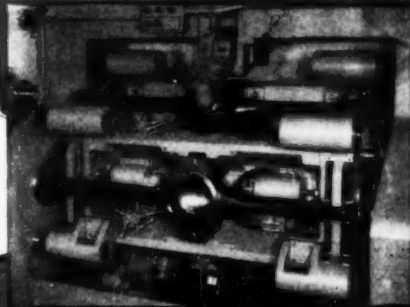
Parts are laid in the loading station and are located and clamped hydraulically. Operations are rough, semi-finish bore and ream bearing diameters at both ends; rough and finish face flanges, chamfer inside and outside edges of flanges and turn O.D. of flanges at both ends; face banjo. All these operations are performed at a net production rate of 55 pieces per hour!

Let Ex-Cell-O help you combine operations for more economical complete staff of experienced production problems. Contact

Let Ex-Cell-O help you combine operations for more economical production. A complete staff of experienced machine tool engineers is ready to help you with your production problems. Contact your Ex-Cell-O representative today!



**Above:** Ex-Cell-O special machine performs many operations on steel rear axle housings.



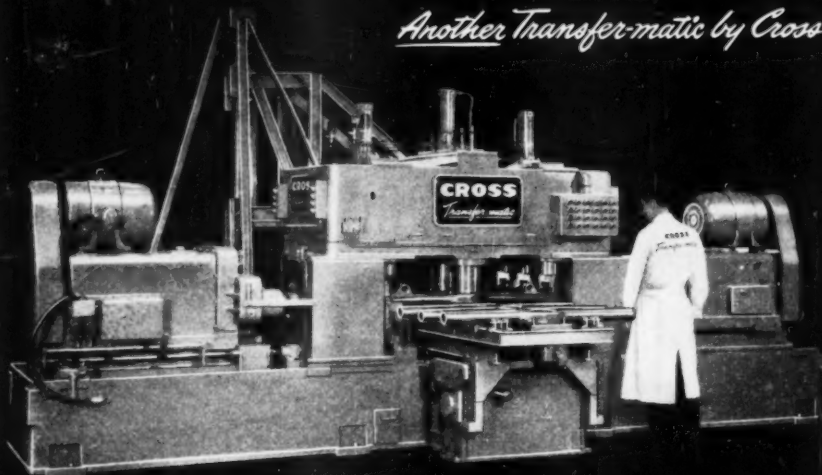
EX-CELL-O for PRECISION

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**Bores and faces 3 types of axles  
—without set-up**



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- ★ Set-up changed automatically for size of part

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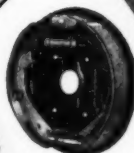
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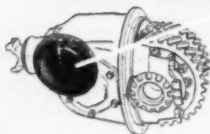


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Power Brake  
for all types  
of trucks



## BENDIX VACUUM-POWER SHIFT

for two-speed axles—smooth, fast, easy!



BENDIX PRODUCTS

DIVISION of



SOUTH BEND 30, INDIANA

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This Bendix Vacuum-Power Shift has proved a worthy companion to Timken-Detroit's great line of 2-speed truck axles, with a record of many years and billions of miles of dependable performance.

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**AUTOMOTIVE  
INDUSTRIES**

Reg. U. S. Pat. Off.

## High Spots of This Issue

### Warner Gear Expands

Although in the midst of a major long-range program of plant change-over and expansion, this largest of the independent manufacturers of passenger car transmissions in the industry is producing in unprecedented quantities. The article views the vast machine units and advanced production methods employed by Warner to keep top production on the move. Turn to page 29.

### Emphasis on Producibility in New Warplane Designs

Air Force requirements now rate the "producibility" of manufacturer design to be on an equal footing with "tactical suitability" and "engineering factors,"—formerly the high-fingering contractual elements. AF is specifying design simplification, parts standardization, and high volume fabrication in case of emergency, as disclosed in this indicative article, page 30.

### Significant Developments in Materials Handling

- 1—A special editorial feature preliminary to the National Materials Handling Exposition is presented by AUTOMOTIVE INDUSTRIES in a series of articles starting on page 36.
- 2—*The Importance of Materials Handling in Automobile Production* points out the great variety of ingenious automatic handling devices and techniques used particularly for handling large irregular awkward stampings, "body drop" assemblies, etc., as revealed on page 38.
- 3—*Selection of Materials Handling Equipment for Aircraft Plant Operations*, as analyzed by two engineers of Northrop Aircraft, Inc., emphasizes the extreme need for protection of surfaces from scratches, and peculiar difficulties in handling light, bulky fragile assemblies so characteristic of aircraft manufacture. The article appears on page 40.
- 4—*Information on Trends in Materials Handling* indicates an increased use of continuous conveyor units in conjunction with the ever popular fork, lift, and floor trucks. A preview of the Materials Handling Show is also given in this account on page 37.
- 5—*New Products at the Materials Handling Show* illustrates many materials handling headlines to be displayed there (page 43). Also a list of exhibitors to the Show is found on page 42.

### 35 New Product Items And Other High Spots, Such As:

International accord on unified screw thread standards; aluminum replacement fenders for Pontiacs; a new two-speed rear axle; and aircraft workers to be in big demand in Spring.

*News of the Automotive Industries, Page 17  
For Complete Table of Contents, See Page 3*



Part Name.....Pawl  
 Material.....SAE 1245 Steel  
 Operation.....Broach side, bevel and end  
 Depth of Cut.....1/16" max.  
 Production.....1120 per hour  
 Machine.....CINCINNATI No. 1-30 Single Ram  
 Vertical Hydro-Broach tooled up  
 for production

Heavy black area indicates broached surface

## SMALL HYDRO-BROACH DOES A BIG PRODUCTION JOB

... broaches  
 over 1100  
 parts  
 per hour



CINCINNATI Single Ram Vertical Hydro-Broach Machine. Complete specifications are contained in catalog M-1389-2. Write for a copy.

Ingenious tooling can make a moderately producing machine look like a streak of lightning. And costs tumble when the "lightning" strikes. Cincinnati Application Engineers, specialists in developing low cost broaching techniques, again show how this can be done. ¶ Starting with a CINCINNATI No. 1-30 Single Ram Hydro-Broach, they tooled it up with a three-section arrangement of broach inserts and a fixture which holds a stack of five parts.

Supplying these parts to the operator in stacks of five, he can readily maintain a production rate of over 1100 per hour. The drawing at the top of page indicates the broached surfaces.

CINCINNATI Hydro-Broach Machines, completely tooled up and ready for production, have reduced costs of hundreds of surface broaching and related operations, including unusual jobs such as cutting off, internally broaching 250° arcs, and others. These machines and Cincinnati Application Engineers can do just as much for you in paring costs. Send blueprints of parts, with complete data, to the address below.

### THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES  
 FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



# NEWS *of the* AUTOMOTIVE INDUSTRIES

Vol. 100, No. 1

January 1, 1949

## **Car & Truck Output in 1948 Second Best in History**

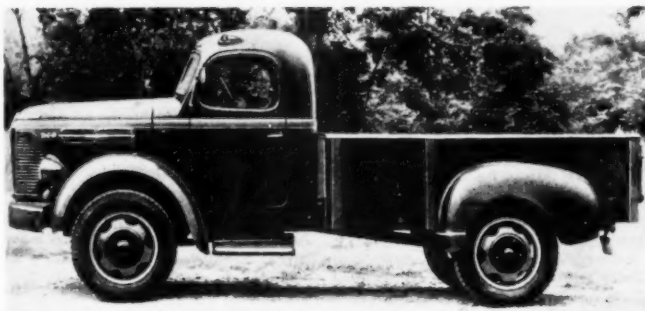
Official figures are not in as yet, but according to the best estimates, the automobile industry had the second best year in its history in 1948. The United States plants are estimated to have built 5,280,000 cars and trucks for a record exceeded only in 1929 when the total was 5,358,000 units. Actually, four days additional output at the December rate would have put the industry well ahead of the previous high year. Passenger car production, however, was more than half a million behind the 1929 total, although 10 per cent ahead of the number built in 1947. Trucks hit a new record estimated at 1,358,000, which is also approximately 10 per cent above the previous record made in 1947. Buses, however, dropped sharply from the all-time high of 19,000 made in 1947, totaling about 13,000 last year. Replacement parts sales in 1948 are estimated to total \$2.6 billion wholesale value, an increase of 10 per cent above 1947, and about four times the prewar rate. The most solid estimates for production this year seem to be in the neighborhood of a 10 per cent overall increase, barring unusual complications from labor troubles or a military crisis.

## **Fire Halts Production at Ford Rouge Plant**

Production of Ford and Mercury cars at the Ford Rouge plant was disrupted for several days during December following a fire on the final assembly line which caused damage estimated at about \$500,000. More than 200 cars were destroyed by the blaze, but fast work by employees saved 300 cars from damage. Total production did not suffer materially since branch plants increased schedules to make up for the lack of operation at the Rouge assembly line.

## **All Pontiac Models to Have One Wheelbase**

GM's Pontiac Motor Div. has abandoned its Torpedo model for 1949, but will still have two models in the line. They are to be known as the Streamliner and the Chieftain, but will be on one



## **PICK UP BY REO**

This new Speed Wagon truck, Reo Model D-19X, with a GVW of 8000 lb was recently announced by Reo Motors, Inc. Powered by a 245-cu. in. Reo-built engine, the new truck is designed for the pick-up market. Reo has also added five new combinations in the D-23 series with GVW ratings of 21,000 to 56,000 lb.

wheelbase and will have identical chassis. The principal difference between the two lines will be in the type of the body styling. The streamliner will have the long sweeping back as in former years, and the new Chieftain will have a bustle or trunk back. The cars are to be shown to the public at the GM Show in New York City on Jan. 20.

Harry J. Klinger, general manager of GM's Pontiac Motor Div. says that the "bloom" is off the station wagon business, but that the demand for convertibles is still good. He predicts that the wood body station wagon will be replaced by all-steel bodies within the next three years.

## **Willys' Net for '48 Fiscal Year is \$6.5 Million**

Representing the company's best profit showing since 1928, Willys-Overland Motors' net profit for the fiscal year ended Sept. 30, 1948, amounted to \$6,528,583 as compared with \$3,280,834 for the previous fiscal year. Total sales of Universal Jeeps, passenger cars, trucks, and other products amounted to \$175,346,360, as against the previous fiscal year's sales of \$138,123,594. Production totaled 135,528 vehicles, a 19 per cent increase over the 113,602 vehicles produced during the previous fiscal year.

## **Chevrolet Lifts Truck Prices**

GM's Chevrolet Motor Div. has raised the prices of its 1949 truck models from \$50 to \$90. However, the increases in prices do not apply to the heavy-duty, two ton models.

## **Large Steel Plant Locates at Detroit**

The McLouth Steel Corp. has acquired an industrial site on the Detroit River at Trenton, just below Detroit, where it will establish a large steel manufacturing plant. The site comprises 208 acres and has ample river frontage for docks. It is also adjacent to main line railroads, and in addition, is strategically located for truck shipments on main highways. It is understood that plans are completed, contracts awarded and that some construction has already begun. It is believed that when completed, the plant will be one of the largest steel manufacturing operations outside of the Pittsburgh area.

## **Ford May Reorganize Overseas Operation**

Although nothing official has come out of Ford on the question, it is ex-

# NEWS of the AUTOMOTIVE INDUSTRIES

pected that there will be some definite action on the reorganization of the company's overseas operations before too long. E. J. Breech, Ford executive vice-president, and two other officials of the company have returned from Europe where they have been surveying Ford's foreign property, and they reported last month to the company policy committee on their findings. Persistent reports say that Ford of France will have a much larger and more important part in the company's overseas set-up when the reorganization is eventually brought about.

## Cadillac Only GM Unit to Hit New Peak in 1948

The Cadillac Motor Car Div. was the only GM division to exceed its prewar production peak last year. The previous high was 55,972 turned out in 1941, and that total was exceeded before the middle of December.

## Secretary of Commerce Reassures Industry

In a general talk devoid of any specific references, Secretary of Commerce Charles Sawyer told the automobile industry in Detroit recently that business would not be sacrificed by the government to stem inflation. He said that business will be asked to make its contribution, but would not be asked to



## NEW ITALIAN CUSTOM

Made by Carrozzeria Ghia S.A. of Turin, Italy, this special custom-built Ghia body is shown on the Fiat chassis which is equipped with a 67-cu in. engine. Featuring curved Plexiglas between two thin roof supports, this car has slotted disks which are fitted to the wheels.

contribute everything, and that there was no reason to fear what the incoming administration might do. He spoke in connection with the automobile industry's commemorative dinner celebrating the building of 100 million vehicles.

## 1948 Tire Production Drops 13 Per Cent

Tire production in 1948 was 13 per cent under the all-time total of more

than 100 million produced in 1947, but was still far above prewar levels. Passenger car tire production is estimated at 67.4 million, compared with 77.8 million in 1947, and truck and bus tires dropped 3.2 million from the 17.8 million total made in 1947. Passenger car and truck tire replacement sales fell off sharply at wholesale during the year, indicating the building up of adequate dealer inventories. Original equipment sales, however, increased for passenger cars, and was approximately the same as the previous year's total for trucks and buses.

## NEW PASSENGER CAR REGISTRATIONS\*

Arranged by Makes in Descending Order According to the Ten Months' 1948 Totals

MAKE	TEN MONTHS			Units			Per Cent of Total	
	1948			1947			1948	1947
	October	September	October	1948	1947			
Chevrolet	80,259	56,834	82,598	589,836	829,842	20.57	20.26	
Ford	99,775	83,454	90,231	370,520	432,086	12.93	16.64	
Plymouth	24,229	28,518	26,354	278,100	280,832	9.70	10.05	
Buick	20,930	20,787	24,509	208,713	201,563	7.28	7.78	
Pontiac	18,367	18,795	17,342	190,093	168,816	6.83	6.50	
Dodge	13,343	16,075	19,495	175,585	173,140	6.05	6.67	
Oldsmobile	15,408	15,311	15,114	182,090	149,410	5.31	5.75	
Studebaker	11,208	11,185	9,993	120,068	83,221	4.19	3.21	
Mercury	15,581	16,794	11,630	111,202	86,366	3.88	3.33	
Kaiser	9,621	8,961	9,643	96,811	40,172	3.38	1.55	
Nash	2,110	4,830	8,175	89,161	86,301	3.11	3.32	
Hudson	8,653	3,851	4,601	88,004	79,359	3.07	3.06	
Chrysler	6,088	8,894	8,333	86,167	77,053	3.01	2.87	
De Soto	5,693	6,506	6,640	66,704	58,608	2.33	2.30	
Packard	4,845	6,012	4,503	63,458	38,283	2.21	1.47	
Frazer	2,114	3,608	6,181	50,731	38,204	1.77	1.47	
Cadillac	6,054	5,533	2,913	50,531	42,459	1.76	1.64	
Lincoln	3,578	2,018	2,198	24,413	19,599	.88	.79	
Crosley	1,619	2,468	1,476	22,995	13,134	.80	.51	
Willis	1,298	989	2,296	17,414	19,682	.61	.78	
Austin	562	793	7,980	7,980	.....	.28	.....	
British Ford	445	640	.....	2,327	.....	.08	.....	
Playboy	.....	11	.....	58	.....	.....	.....	
Tucker	.....	.....	.....	2	.....	.....	.....	
All Others	1,067	1,186	43	5,740	681	.20	.03	
Total	291,442	296,339	281,428	2,866,303	5,96,034	100.00	100.00	

\* Data from R. L. Polk & Co.

## ACF-Brill to Make All Buses for Avco

Shortly after Jan. 1, 1949, all bus manufacturing of Avco Manufacturing Corp.'s affiliates will be concentrated at the ACF-Brill Motors Co. plant in Philadelphia. This was recently disclosed by the Nashville Corp., an Avco affiliate, which stated that bus manufacturing at its plant in Nashville, Tenn., would stop when the change is made.

ACF-Brill has boosted the prices of its buses about nine per cent. Continued increases in costs of raw materials and labor made the increases necessary, according to Ronald R. Monroe, president and general manager.

## Playboy Considering New Financing Plan

The Playboy Motor Car Corp. is again considering a new financing program. A few months ago the company withdrew a common stock offering of two

# NEWS of the AUTOMOTIVE INDUSTRIES

million shares at \$1 a share. The company meanwhile has shown a new five-passenger station wagon model which reportedly will be built in addition to the three-passenger convertible shown early last year. Playboy is also reported to have arranged with Graham-Paige Motors Corp. for Playboy dealers to handle Rototillers and Jaques-Frazer tractors.

## Continental Gets Order for Aircooled Engine

Further details about its military contract for new aircooled tank engines have been released by Continental Motors. The order for the engines amounts to \$18.8 million, and it is understood that another \$9 million is involved for facilities and special tooling required to produce the order, although no official confirmation has been given as to the cost of the tooling. The contract is for a 12-cyl., V-type model developing 810 hp and 1040 hp when supercharged. The engine will be built in Continental's plant at Muskegon, Mich., and in a large government-owned factory there. The cost to the government will be minimized by using facilities and tooling already available at Continental's Muskegon operations.

## Military Truck Orders Developing Slowly

The negotiation of contracts for one-quarter and three-quarter ton military trucks is going much more slowly than Army Ordnance would like. Both manufacturers and negotiators for the Army are apparently in no hurry to rush into new contracts.

## Curtiss-Wright Names Vaughan Chairman

Guy W. Vaughan, president, Curtiss-Wright Corp., and president of its subsidiary, Wright Aeronautical Corp., has been elected chairman of the board of Curtiss-Wright by the board of directors, relinquishing active management of the business. He retains the office of chairman of Wright Aeronautical. William C. Jordan, vice president and general manager of Wright Aeronautical, has been elected president of both Curtiss-Wright and Wright Aeronautical.

## Ford Ships Hauled Record Iron Ore Tonnage in '48

Hauling a total of 1,029,494 gross tons of iron ore to the Ford Motor Co.'s Rouge plant during the season from April 16 to Nov. 30, 1948, Ford's ships, the MS Henry Ford II and MS Benson Ford, broke all previous records.

## Armed Services Procurement Rules Allow New Costs

Following coordination by the Munitions Board, the Army, Navy, and Air Force have adopted a new section of the Armed Services Procurement Regulation, Section XV, "Contract Cost Principles." Becoming mandatory on Feb. 1, 1949, the new section deals with the types of costs allowable in research and development, supply and material, and construction cost type contracts. Four major items not previously allowable in computing contract costs are now permissible: (1) state income taxes; (2) use and occupancy insurance; (3) ordinary local charity and community benefit donations; and

charges for depreciation on fully depreciated assets. Advertising in trade and technical journals is also allowable on research and development, and supply and material cost type contracts.

## Big Steel Wants Freight Absorption Legalized

Big Steel has gone on record as favoring Congressional action to legalize freight absorption to permit meeting of competition in any and all markets. In letters to Senator Capehart, Chairman of the Trade Policies Subcommittee, top officials of U. S. Steel, Bethlehem, Republic, and National dispelled rumors to the effect that important segments of the steel industry were satisfied with FOB mill selling. It is significant, perhaps, that in none of the replies did the term "basing point" or "basing point system," appear although all were agreed that legalized freight absorption was necessary to proper competitive relationships.

Specifically, the Committee asked the heads of these companies if they would "adopt the practice of absorbing freight on sales to distant customers, in order to make delivered prices to these customers competitive with the delivered prices of steel mills located closer to those customers?" if permitted by Congress to do so. David F. Austin, vice president, U. S. Steel, replied with an emphatic "Yes," and added that such practice will be adopted immediately upon being permitted by law to do so. However, Mr. Austin took issue with the statement in the letter from Senator Capehart which referred to "substantially increased revenue" accruing to the steel companies as a result of the switch to FOB mill selling. The U. S. Steel executive stated that it was



Authenticated News

## OUT OF THE WIND TUNNEL

The latest version of the Czechoslovakian Tatra automobile, the Tatra 87, shown above, displays streamlining which is said to have been designed as the result of exhaustive wind

tunnel experiments. Powered by an aircooled 8-cyl engine located in the rear, which develops 75 hp, the Tatra 87 reportedly has a maximum speed of 100 mph.



# NEWS of the AUTOMOTIVE INDUSTRIES

unrealistic to say that 75 cents per ton average reduction in mill net returns experienced under the previous policy of freight absorption can now be calculated as a gain in revenue as a result of FOB selling. He further pointed out that FOB selling on the part of U. S. Steel's suppliers has increased production costs about 10 cents per ton. Elaborating on the effect of the switch to FOB mill on U. S. Steel, Mr. Austin further stated that "the change to mill pricing occurred prior to our general price increase in steel products made in July, 1948. The new prices embraced a restoration of the average price reduction of about \$1.25 a ton made by these subsidiaries last spring, and in addition included an average increase of approximately \$8.09 a ton. Since the change in selling method took place prior to the increase and since any possible advantage which might

pickups. Sales have been tapering off and registrations for last year are estimated at 1,030,000 new trucks. The registration figures do not include trucks going to export or government-owned vehicles, and other minor classifications, and it is difficult, therefore, to tell what total sales were in 1948. It is very evident that the industry ended the year with a considerable number of trucks in dealers' hands and in manufacturer's inventory.

## Bendix President Made Head of Parts Makers

M. P. Ferguson, president, Bendix Aviation Corp., has been named president of Automotive & Aviation Parts Manufacturers, Inc. Other officials are R. H. Daisley, vice-president, Eaton Mfg. Co., vice-president; and J. L. Myers, president, Cleveland Graphite

search airplane, the X-1. Captain Charles E. Yeager, USAF pilot, was honored for first achieving human flight faster than sound in the X-1.

## Ford to Increase Ratio of Car and Truck Ads

The Ford Motor Co. is planning to increase its over-all advertising appropriation for passenger car and truck advertisements in relation to other company products this year, according to J. R. Davis, vice-president in charge of sales and advertising. He reports also that the company is watching television closely, and that appropriations for this type of advertising may be increased in 1949. Other media used will be trade publications, farm papers, and newspaper comic sections. Ford and Lincoln-Mercury dealers have indicated that

## BIG BUY

The Kaiser-Fraser Corp. has purchased the government's bomber plant in Willow Run, Mich., shown here, reportedly one of the largest and most complete industrial installations in the world. The plant was bought through the WAA recently for \$15.1 million.



have been derived from the change in selling method had already occurred and was so small in relation to the increase, it cannot fairly be said that the change has resulted in any substantially increased revenue.

## Packard Makes Progress On Automatic Drive

It is known that the organization of Packard's automatic transmission division is proceeding rapidly and that tooling is being acquired as quickly as possible. It is understood that the total cost of the tooling for the division will be several million dollars. It is likely that Packard will have the new automatic unit, which is reported to be of a torque converter type, ready for production sometime later this year.

## Most Truck Models In Buyers' Market

There is no doubt that the truck industry generally has reached a buyer's market in all models except the very lightest weight jobs such as panels and

Bronze Co., as secretary. Also elected were five directors for three year terms. They are L. M. Clegg, executive vice-president, Thompson Products, Inc.; A. G. Drefs, president, McQuay-Norris Mfg. Co.; W. G. Hancock, president, McCord Corp.; D. H. Kelly, executive vice-president, The Electric Auto-Lite Co., and J. L. Myers, president, Cleveland Graphite Bronze Co.

## Collier Award to Three for Supersonic Flight

The nation's highest annual aviation award, the 1947 Collier Trophy, has been awarded to the three men "most responsible" for the achievement of supersonic flight, the National Aeronautics Association has announced. John Stack, research scientist for the National Advisory Committee for Aeronautics, was honored for his research to determine the physical laws affecting supersonic flight. Lawrence D. Bell, president, Bell Aircraft Corp., was awarded for the design and construction of the special supersonic re-

there will also be stronger emphasis in local newspaper advertising and increased use of spot radio and spot television from the Ford dealer advertising fund.

## Willys-Overland Buys Two Plants from the WAA

Willys-Overland Motors, Inc., has purchased two surplus government-owned wartime manufacturing facilities at Toledo, O., for \$861,881.50, the War Assets Administration has announced. One of the properties consists of a four-story building, located on a site of 6¼ acres, which contains 467,000 sq ft of floor space. The other is a three-story building, known as the Toledo Core Plant, situated on a plot of 3½ acres, and containing 350,000 sq ft of floor space.

## Freight Rate Hikes May Force Decentralization

N. J. Brennan, traffic director for the Chrysler Corp., said in Detroit recently



# NEWS of the AUTOMOTIVE INDUSTRIES

that increasing rail freights might force the automobile industry into further decentralization. The statement is significant coming from a Chrysler official since that company has followed a program of concentrating its manufacturing in Detroit. Chrysler has a Plymouth assembly plant at Evansville, Ind., and this year opened a new Dodge assembly plant at San Leandro, Calif. Comparatively, however, Chrysler is by far the least decentralized of the Big Three.

## South African Import Curb Hurts U. S. Car Firms

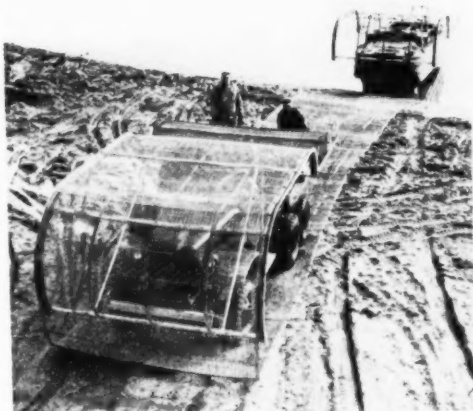
Automobile companies with assembly plants in South Africa have been adversely affected by that government's effort to curb imports. Ford and GM have completed plant additions costing \$5 million in the country, and both have asked for supplementary dollar quotas to protect their investments. Hudson and Chrysler assembly operations are also affected. Automobiles costing more than \$2,000 are among the items banned from import by the South African government.

## Social Security Program Clicks at K-F

The Kaiser-Frazer employees have been quick to take advantage of the new social security program provided by the company. K-F reports that 16,770 em-

## ROTARY ROADWAY

Now being tested at the Marine Corps Base at Quantico, Va., these portable roadway mats, new lightweight landing and beach matting for amphibious operations, can be launched from special frames mounted atop either a truck (front) or amphibious "duck" (rear). Each vehicle can carry about 250 ft of landing mat on each load.



Army

ployes and 28,000 dependents receive free hospitalization, \$2,000 free life insurance, and minimum sick and accident benefits of \$15 a week for a maximum of 13 weeks. The program which went into effect last Oct. 1 is financed by two separate funds through payments of five cents an hour for each hour worked by employees covered. The fund is administered jointly by representatives of the company and the union. A second fund administered only by the company

covers employees not eligible under the joint union-company fund.

## Trailmobile Opens \$250,000 Center in Denver

The Trailmobile Co., Cincinnati, O., has opened a new \$250,000 service center and modification plant in Denver, Colo. The Denver plant is built on a six-acre tract on the outskirts of the city, and includes a 26,000-sq ft building.

## Echols Named as Head of AIA and as Northrop Chairman

Eugene E. Wilson and Major General Oliver P. Echols, (USAF, ret.), were reelected chairman of the board and president, respectively, of the Aircraft Industries Association at the annual meeting of the board of governors. General Echols, who will become chairman of the board of Northrop Aircraft, Inc., on Feb. 1, will remain as AIA president until a successor is chosen. Chosen as AIA vice presidents were J. H. Kindelberger, board chairman, North American Aviation, Inc., and Malcolm Ferguson, president, Bendix Aviation Corp. Leland D. Webb, western regional manager of the Association, was reelected as vice president, and Harrison Brand, Jr., was reelected secretary-treasurer.

New members of the AIA board of governors named at the meeting were LaMotte T. Cohn, president, Consolidated-Vultee Aircraft Corp.; Chester H. Lang, vice president, General Electric; Frederick C. Crawford, president, Thompson Products Co.; and C. J.

## NEW TRUCK REGISTRATIONS\*

Arranged by Makes in Descending Order According to the Ten Months' 1948 Totals

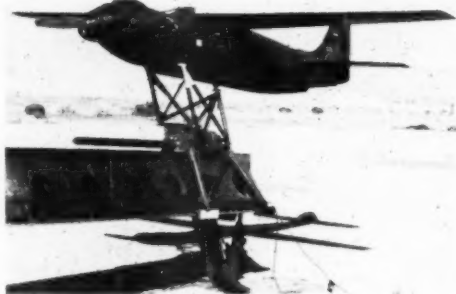
MAKE	TEN MONTHS							
	Units				Per Cent of Total			
	October 1948	September 1948	October 1947	1948	1947	1948	1947	
Chevrolet	25,302	23,704	25,970	254,723	183,352	26.62	24.85	
Ford	17,841	16,979	17,142	199,233	170,582	22.39	23.12	
International	8,211	8,504	11,390	110,404	95,622	12.41	12.96	
Dodge	8,409	10,583	11,801	97,320	108,260	10.94	14.67	
G. M. C.	7,448	7,192	4,672	82,195	40,115	6.99	9.44	
Willlys Jeep	3,408	4,747	4,822	43,561	40,488	4.90	5.49	
Studebaker	4,256	4,290	3,889	42,012	34,935	4.72	4.74	
Willlys Truck	2,374	2,284		22,869		2.58		
White	822	861	1,275	9,958	11,010	1.12	1.49	
Reo	571	758	1,080	9,573	10,926	1.08	1.48	
Diamond T	760	947	1,080	9,376	8,854	1.05	1.20	
Mack	820	669	1,215	8,659	9,128	.97	1.24	
Diveco	813	426	612	5,048	4,118	.57	.86	
Federal	230	237	598	3,688	4,965	.41	.67	
Brockway	228	206	412	2,811	3,611	.29	.49	
Autocar	232	186	378	2,306	3,751	.26	.51	
Crosley	135	184		2,149		.24		
F. W. D.	37	40	102	727	998	.08	.14	
Sterling	31	18	64	372	498	.04	.07	
Kenworth	47	38		371		.04		
Ward La France	15	5	42	248	441	.03	.06	
Oshkosh	12	4	11	150	199	.02	.03	
Hudson	1		97	113	2,490	.01	.34	
Nash	1			17				
All Others	260	246	515	2,145	3,342	.24	.45	
Total	84,284	85,108	87,167	889,868	737,705	100.00	100.00	

\* Data from R. L. Polk & Co.

# NEWS of the AUTOMOTIVE INDUSTRIES

## ONE FOR THE GUN

Perching on its 60-ft catapult prior to take off, the USAF's newest remote-controlled target plane, the OQ-19A, has a speed of 220 mph. It is launched by a rocket which boosts it along the catapult to a speed of 80 mph for take off. Powered by a four-cyl engine developing 60 hp, the plane has a 12-ft wing span, is 10.5 ft long. It is made by the Radioplane Co., Van Nuys, Calif.



Reese, president, Continental Motors Corp. Mr. Cohe replaces Harry Woodhead, former Convair president now with Douglas Aircraft Co., and Mr. Reese replaces Dwane Wallace, president of Cessna Aircraft Co.

## Pharis to Stop Making Tires

The Pharis Tire & Rubber Co. has announced that it is going to stop manufacturing tires, and as soon as possible the company will be dissolved. The company's plants in Newark, O., are to be sold, and the machinery auctioned Jan. 18-20, 1949. Burt Pharis has incorporated a sales agency known as Pharis Inc. which will continue to supply Pharis automotive tires and tubes to the established Pharis trade. The tires will be made by The Mansfield Tire & Rubber Co., and the tubes by Carlisle Tire & Rubber Div., Carlisle Corp., Carlisle, Pa.

## Max Monroe Made Manager of GM's Aeroproducts Div.

Max M. Monroe has been named acting general manager of GM's Aeroproducts Div., Dayton, O. He succeeds W. G. Blanchard, who was killed in a plane crash. Mr. Monroe has been assistant to E. R. Godfrey, GM vice-president and group executive.

## Army Ordnance Firm on 24-v Ignition

Although both manufacturers and the NSRB have voiced doubt about 24-v ignition systems on all military vehicles, Army Ordnance is standing pat on its dictum issued two years ago that all military vehicles be so equipped.

## GM Private Teletype Connects All Units

GM has installed a new fully automatic private wire teletype system connecting all of its plants in 46 cities in the U. S. and Canada. Routed through the central office in Detroit, all messages are then sent directly to their destination. The network is a two-way system permitting stations to send and receive simultaneously. It can handle approximately 1,360,000 words daily.

and comprises 14 incoming lines and an equal number of outgoing circuits. A mechanical device scans the addresses of the messages, and directs them into their proper channels.

## Packard Discusses Plans for Three-Year Franchise

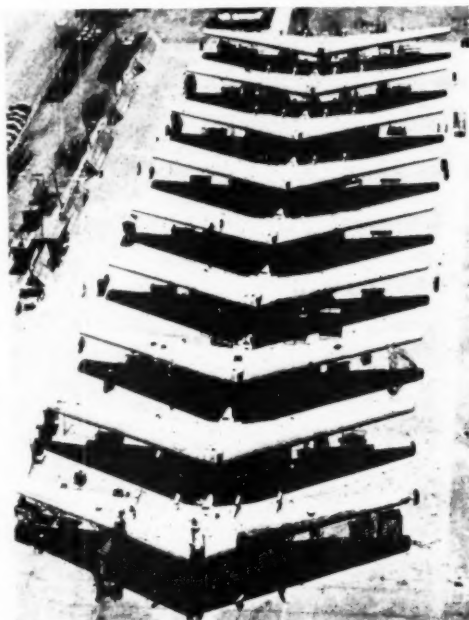
Three-year dealer franchises for outstanding Packard dealers may result from discussions between factory executives of Packard and its dealer advisory counsel. Such a development would be a radical departure from the traditional industry practice under which dealer franchises are renewed on an annual basis. While details of the plan have not been definitely formulated, it is believed that the three-year franchises would be extended on the basis of meeting certain requirements such as customer service facilities and others which the company considers essential to sound business practice.

## NSPA Elects Crowder President for 1949

Members of the National Standard Parts Association elected Charles R. Crowder, vice-president and sales director, Van Norman Co., Springfield, Mass., president of the association for the

## NINE ON THE LINE

In the process of being converted to jet-powered aircraft for the U. S. Air Force, these nine 100-ton Northrop Flying Wings fit on this ramp at the Northrop Aircraft Field, Hawthorne, Calif., in the space where four conventional airplanes would usually find room.



# NEWS of the AUTOMOTIVE INDUSTRIES

1949 term. He succeeds E. M. Sheehan, president, Motive Parts Co. of Pennsylvania, Pittsburgh, who becomes an ex-officio member of the board of directors for the next year. Elected also as officers of the manufacturer-wholesaler association for the coming year are: G. W. Kleinschmit, an executive of the Automobile Equipment Co., Detroit, Mich., who served as junior vice-president in 1948, to the office of senior vice-president; and C. C. Tapscott, advertising manager for McQuay-Norris Manufacturing Co., St. Louis, Mo., who was one of the directors and a member of the Executive Committee for 1948, to the office of junior vice-president and director.

## Borg-Warner Calls Off Deal for Steel Plant

The Borg-Warner Corp. has dropped its negotiations with the Copperweld Steel Co. for the purchase of an interest in a Warren, O., steel plant. Previous reports had stated that the two companies were near agreement on the deal.

## British October Car Exports 70% of Output

Production of automobiles in England during October totaled 26,156 units of which more than 18,000 went to the export market. Total purchases by the United States during the month were 2700, the largest for any country. During the same month, United States production of passenger cars was 375,000 of which 22,000 were exported.

## Two Rocket and Jet Centers at Princeton and CalTech

The Daniel and Florence Guggenheim Jet Propulsion Center is to be established at the California Institute of Technology for jet and rocket research. One of two such centers, the other is to be established at Princeton University. The Daniel and Florence Guggenheim Foundation has appropriated \$500,000 to support the two centers for a seven-year period.

## Name Hufstader to Serve on Highway Safety Group

W. F. Hufstader, GM vice-president, has been appointed to serve as one of three representatives from the Automobile Manufacturers Association on the Inter-Industry Highway Safety Committee. Mr. Hufstader will replace W. G. Levellen, former member and

vice-chairman of the Committee, who recently resigned as a GM vice-president.

## French Loan to Rebuild Automobile Industry

War damages to the French automobile and kindred industries are tabulated at \$31 million. Reconstruction already carried out at the expense of the firms involved amounts to \$21,505,000, and with a view to completing this work the government has authorized the issuance of a loan of \$9,470,000, of

Sometime during the summer months the first two phases of the tests will get under way in the mid-West, and finally the controlled tests will be held in the East. The third phase, tests on new vehicles, is being conducted by the Automobile Manufacturers Association. Reports on the individual phases of the program will be released as they are completed.

## See Reduction in Number of Government Cars

Watch for a strong campaign to re-



## INTENDED FOR INSTRUCTION

Designed by the Douglas Aircraft Co. for the U. S. Air Force, this mock-up of a new single-engine trainer, the XT-30, was completed recently. To be powered by a Wright R-1300 engine, rated at 800 hp on take-off, the new trainer has a wing span of 36 ft. 4 in., and a length of 36 ft. 9.5 in. It will reportedly have a top speed of 286 mph at 10,000 ft.

which one-half will be immediately offered for public subscription and will carry five per cent interest. The loan is guaranteed by the French government, which will place the funds in the hands of a bank authorized to meet war damage claims. The claimants are automobile and accessory manufacturers and one important bicycle maker.

## Public Roads Agency Conducts Brake Tests

The Public Roads Administration, with the assistance of the Advisory Committee of Motor Vehicle Brake Research, began a series of brake tests on the West Coast late last month. The first phase of the tests, brake tests of vehicles selected at random from the general traffic, has been completed in Maryland. This type of testing will also be conducted on the West Coast.

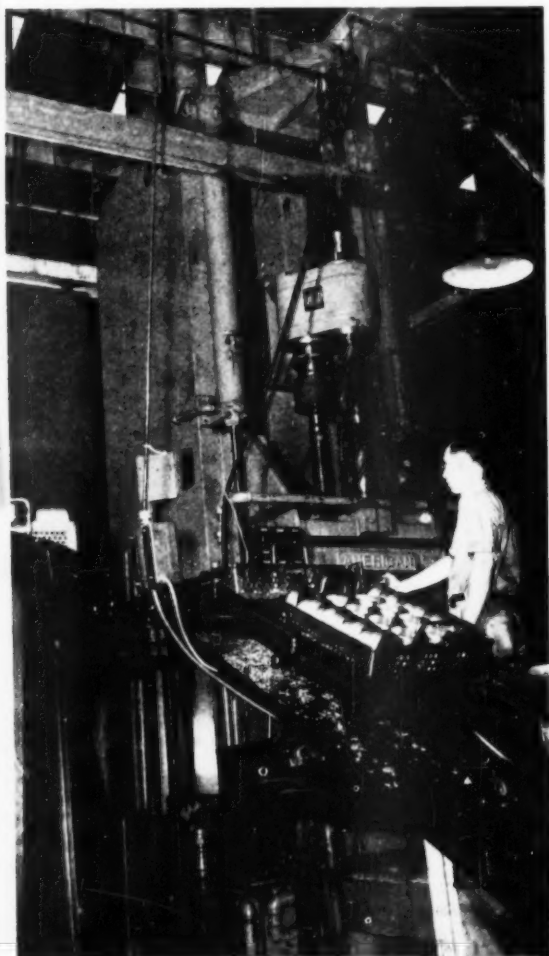
duce the number of motor vehicles operated by the civilian departments of the Federal Government. As of June 30, 1948, 80,262 vehicles were being used by civilian agencies as compared with 72,844 a year earlier. Analysis of the annual motor vehicle report, submitted by the agencies for the second time this year, indicates a definite need for reducing the number of vehicles, according to government motor vehicle experts. During the fiscal year ended June 30, 1948, federally operated motor vehicles in the United States were run more than 523 million miles. However, these vehicles averaged only 30 mi each per working day. Not counting replacements, it costs the taxpayer almost \$36 million to operate and maintain this 80,000 vehicle fleet and to supply it with 65 million gallons of fuel.

(Turn to page 64, please)

# W

ITHOUT interrupting the steady flow of passenger car transmissions and overdrive units which have been produced in unprecedented quantities since the end of the war, the Warner Gear Division, Borg-Warner Corp., is in the midst of a long range program of plant expansion and rearrangement of equipment and departments. Focal point of this program is their Plant 3 situated some distance from the main plant, possessing as much as two-thirds of the floor space of the entire establishment with its 19 acres of space under roof.

At the present writing Plant 3 has absorbed all of the gear and shaft production of the operation. In addition to the other advantages of such centralization,



Here is the enormous vertical American broaching machine tooled for broaching 48 internal spiral teeth in the overdrive ring gear. The machine has two big broaching tools and cuts two gears at a time.

# Warner

the setup removes the precision gear operations from all connection with cast iron machining.

Warner Gear is the largest independent passenger car transmission producer in the industry, and by the very nature of diversification of customers it handles such a large variety of types and sizes that production management must rely to a great extent upon advanced methods, using equipment of flexible type suitable for change-over to a variety of similar parts.

Plant 3 abounds in modern machinery of the latest types known to the art. One of the most interesting techniques is their experimental production of shafts on two of the Bullard Man-Au-Trol, three-spindle machines fitted with cemented-carbide tooling. The latest word in fast, automatic turning cycles, these machines are doing an outstanding job on several of the transmission shafts.

Here too is found what is said to be the largest installation of continuous automatic gas carburizing furnaces in this country. It consists of seven Surface-Combustion gas carburizing furnaces of continuous type in a centralized department. Some impression of the capacity of this equipment may be gained from the fact that the department handles the heat treatment of a million lb of gears and shafts in a five-day work week.

The monorail conveyor line, is about a half-mile in length, and provides for the transportation of parts from the machine shops to the heat treating department. To assure continuous operation of heat treating facilities, the company recently installed two 30,000 gallon capacity propane storage tanks. Seventy-one ft long and nine ft in diameter, these tanks provide a gas reserve always in readiness for immediate conversion in the event of a shortage or temporary stoppage of the natural gas supply.

Considering the extent of manufacturing facilities in Muncie, Ind., it would be quite difficult to do justice to the set-up by even a sampling of facilities. The object of this ar-

# Gear Expands

By  
Joseph  
Geschelin

ticle is simply to give the highlights of a few selected operations of unusual character and having wide interest to the industry.

For example, here is an enormous American broaching machine which is tooled to broach an internal spiral gear. This 42-tooth gear has a pitch diameter of 3½-in. The machine is fitted with two broaching tools and cuts two gears at a time.

Another example, typical of similar arrangements in this plant, is the group of National Broach Red Ring shavers used for shaving overdrive pinions. To assure concentricity of the pitch diameter of the pinion with the bore, it is the practice to mount the pinions, two at a time, with a press fit on an arbor. A similar procedure is followed in hobbing gear teeth on Barber-Colman hobbing machines. The illustration shows the operator pressing the gear on the arbor on a Colonial

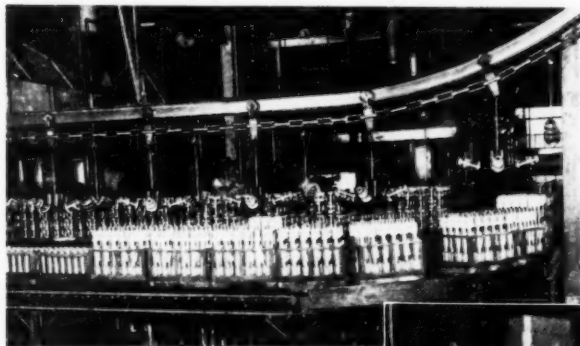
press prior to shifting the loaded arbors to the Red Ring shavers.

The overdrive pinion cage is a unique example of production development. Originally the cage was made in two sections which were later riveted together. This was found necessary because the outer section of the cage required the broaching of spiral teeth and there was insufficient clearance below the part to permit conventional broaching. In current production the cage is made in one piece. Broaching of the spiral teeth is done in a Colonial broaching machine having a rotary indexing table containing a group of ten short broaching tools. The work is held in a chuck in the ram and is pressed over the broaching tool with an extremely short stroke. It takes ten strokes of the ram to complete the broaching operation, the tools being indexed progressively to the work station between strokes.

Another problem in connection with the overdrive pinion cage is that of selective hardening of the spiral tooth section mentioned above. The hardening is done in a Reeves Electronics induction heating unit.

Warner Gear is making extensive use of the latest type Micromatic Micro-Size principle honing machines for honing various bores. A typical installation, is the two-spindle Micromatic hone with an indexing table holding four passenger car cluster gears. It may be noted that

*(Turn to page 84, please)*

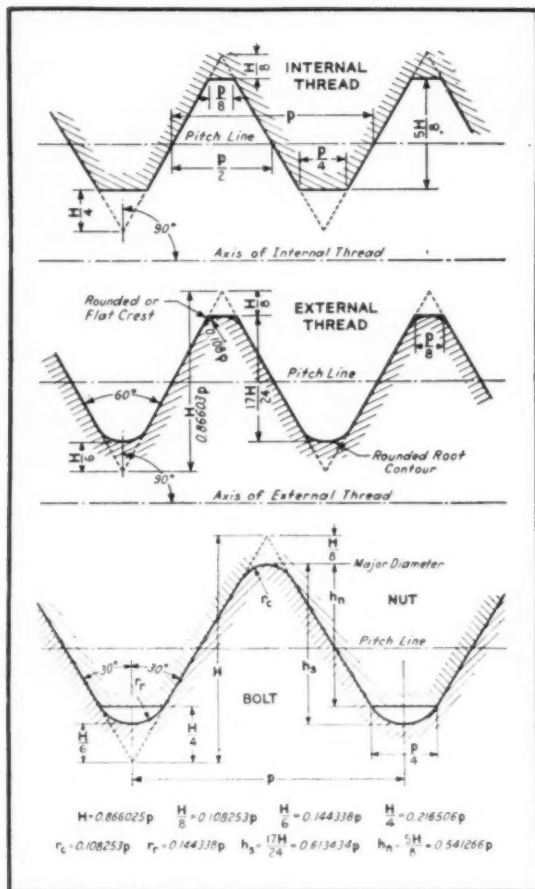


*(Above) This shows the heavy loads of parts moving on the conveyor from the machine shop to the heat treating department. In the foreground may be seen the parts as they are removed from the conveyor and loaded into carburizing racks ready to enter the furnace.*



*(Right) Typical of many compact machine groups designed to facilitate handling by a single operator is this group of Red Ring shavers for shaving spiral teeth on overdrive pinions. The operator is in the act of pressing two gears onto the arbor. The loaded arbor then is placed between centers in the shaver.*





THE signing of an international accord here recently by representatives of the United States, United Kingdom, and Canada now makes possible for the first time in history complete interchangeability of bolts, nuts, and other threaded products manufactured in the three nations. The reaction of the automotive industries in the United States is said to be very favorable to this international unification of screw threads.

Details and specifications for the U. S. were drawn up by the National Bureau of Standards, working in cooperation with the Sectional Committee on the Standardization and Unification of Screw Threads. This committee was organized under the American Standards Association and was sponsored by the American Society of Mechanical Engineers and the Society of Automotive Engineers. Representatives of the Departments of the Army, Navy, Air Force and Commerce also represented the U. S. through the Interdepartmental Screw Thread Committee.

The Bureau of Standards points out that while

## International Unified

The American-British-Canadian Unified Screw Thread Standards provide for the interchangeability of American and British threaded parts, but certain details of thread form remain optional. The diagram shows the American preferred form of internal thread (above) with flat crests and roots, the unified external thread (center) with rounded roots and either rounded or flat crests, and the British preferred form (lower) with rounded root contours and flat crested internal thread. The unification agreement calls for 60-deg flank angles, rounded roots on external threads, and flat crests on internal threads.

agreement on all fundamental points has been reached, there still are minor details to be worked out and it is expected that several years will be required to effect the changes completely in all three countries.

The new unification agreement provides a 60-deg angle and a rounded root for screw threads. The crest of the thread may be flat, as preferred in U. S. practice, or rounded, as preferred by the U. K.

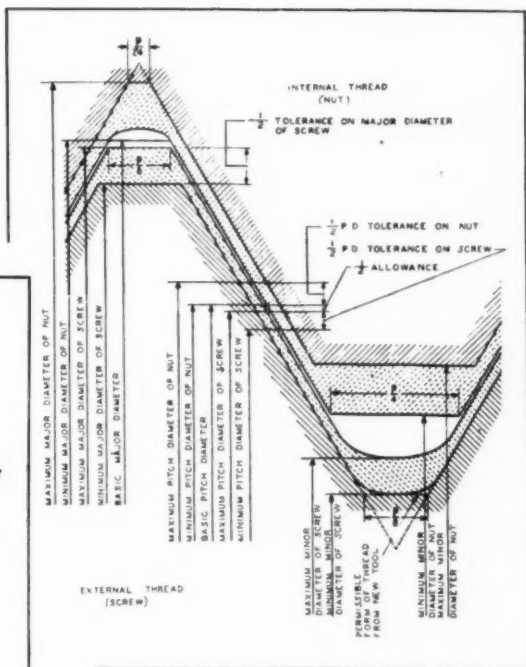
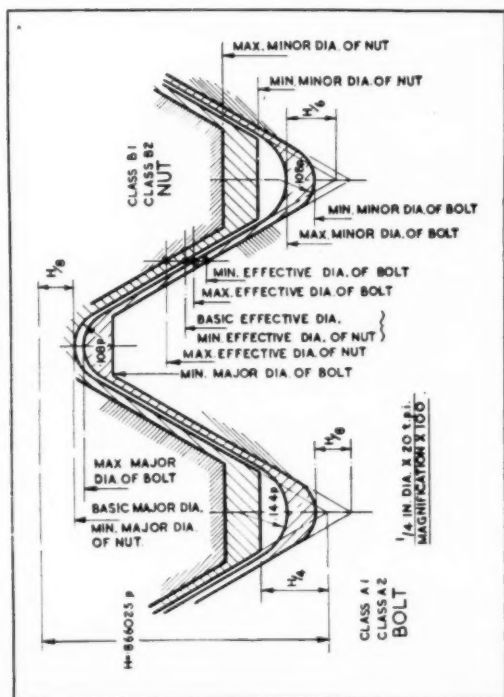
The sizes agreed upon, the threads per inch, and the basic dimensions of the unified coarse and fine thread series are listed in Tables 1 and 2. These and other tables, together with the agreements that (1) the minimum internal thread will be basic and the allowances, or minimum clearances on the flanks of the threads, will be applied to the external threads and (2) tolerances will be in the minus direction on the external thread and plus direction on the internal thread, will assure interchangeability of threaded products. Threaded parts of standard diameters and threads per inch, made in accordance with these principles, will always assemble freely.

There is, however, a further degree of interchangeability attained by agreements on the numerical values for allowances and tolerances, thereby setting limits to the least and greatest amounts of looseness between mating parts. Such agreement provides for identity of sizes (or interchangeability of use) of screw thread gages used in the different countries for controlling



# Accord on Screw Thread Standards

(Right) An important part of the American-British-Canadian Unified Screw Thread Standards is the specification of tolerances, allowance, and crest clearances for each class of fit. The American diagram shows the critical dimensions which must be controlled in the manufacture of screw thread components. Classes of fit are distinguished from each other by the permissible limits of looseness or tightness.



(Left) The limiting dimensions on thread sizes for three classes of fit have been agreed upon in the new American-British-Canadian Unified Screw Thread Standards. The British diagram shows tolerance zones and detailed clearance data for unified threads on class 1 and class 2 bolts and nuts.

# International Accord

Table 1—Basic dimensions of unified coarse thread series\*

Size	Basic Major Diameter	Threads Per Inch	Basic Minor Diameter	Minor Diameter External Threads	Minor Diameter Internal Threads	Lead Angle At Basic Pitch Diameter	Section at Minimum Minor Diameter	Stress Area
	D	n	E	$D_2$	$D_2$	Dep. Min.	Sq. In.	Sq. In.
1/4 (1.315)	0.375	14	0.262	0.258	0.251	5° 31'	0.0422	0.0422
5/16 (1.315)	0.3125	18	0.244	0.240	0.233	5° 22'	0.0335	0.0335
3/8 (1.315)	0.375	16	0.250	0.246	0.239	5° 26'	0.0401	0.0401
1/2 (1.315)	0.500	12	0.375	0.371	0.364	5° 45'	0.0706	0.0706
5/8 (1.315)	0.625	11	0.469	0.465	0.458	5° 57'	0.0974	0.0974
3/4 (1.315)	0.750	10	0.562	0.558	0.551	6° 00'	0.1217	0.1217
7/8 (1.315)	0.875	9	0.656	0.652	0.645	6° 04'	0.1434	0.1434
1 (1.315)	1.000	8	0.750	0.746	0.739	6° 08'	0.1626	0.1626
1 1/8 (1.315)	1.125	7	0.844	0.840	0.833	6° 12'	0.1796	0.1796
1 1/4 (1.315)	1.250	7	0.938	0.934	0.927	6° 16'	0.1946	0.1946
1 3/8 (1.315)	1.375	6	1.031	1.027	1.020	6° 20'	0.2076	0.2076
1 1/2 (1.315)	1.500	5	1.125	1.121	1.114	6° 24'	0.2186	0.2186
1 3/4 (1.315)	1.625	4	1.219	1.215	1.208	6° 28'	0.2276	0.2276
2 (1.315)	2.000	4	1.500	1.496	1.489	6° 32'	0.2446	0.2446
2 1/8 (1.315)	2.125	3	1.594	1.590	1.583	6° 36'	0.2596	0.2596
2 1/4 (1.315)	2.250	3	1.688	1.684	1.677	6° 40'	0.2726	0.2726
2 3/4 (1.315)	2.625	2	1.875	1.871	1.864	6° 44'	0.2876	0.2876
3 (1.315)	3.000	2	2.125	2.121	2.114	6° 48'	0.3006	0.3006
3 1/8 (1.315)	3.125	2	2.219	2.215	2.208	6° 52'	0.3136	0.3136
3 1/4 (1.315)	3.250	2	2.313	2.309	2.302	6° 56'	0.3246	0.3246
3 3/4 (1.315)	3.625	2	2.600	2.596	2.589	7° 00'	0.3396	0.3396
4 (1.315)	4.000	2	2.875	2.871	2.864	7° 04'	0.3526	0.3526
4 1/8 (1.315)	4.125	2	2.969	2.965	2.958	7° 08'	0.3636	0.3636
4 1/4 (1.315)	4.250	2	3.063	3.059	3.052	7° 12'	0.3746	0.3746
4 3/4 (1.315)	4.625	2	3.350	3.346	3.339	7° 16'	0.3896	0.3896
5 (1.315)	5.000	2	3.625	3.621	3.614	7° 20'	0.4006	0.4006
5 1/8 (1.315)	5.125	2	3.719	3.715	3.708	7° 24'	0.4116	0.4116
5 1/4 (1.315)	5.250	2	3.813	3.809	3.802	7° 28'	0.4226	0.4226
5 3/4 (1.315)	5.625	2	4.100	4.096	4.089	7° 32'	0.4376	0.4376
6 (1.315)	6.000	2	4.375	4.371	4.364	7° 36'	0.4486	0.4486
6 1/8 (1.315)	6.125	2	4.469	4.465	4.458	7° 40'	0.4596	0.4596
6 1/4 (1.315)	6.250	2	4.563	4.559	4.552	7° 44'	0.4706	0.4706
6 3/4 (1.315)	6.625	2	4.850	4.846	4.839	7° 48'	0.4856	0.4856
7 (1.315)	7.000	2	5.125	5.121	5.114	7° 52'	0.4966	0.4966
7 1/8 (1.315)	7.125	2	5.219	5.215	5.208	7° 56'	0.5076	0.5076
7 1/4 (1.315)	7.250	2	5.313	5.309	5.302	8° 00'	0.5186	0.5186
7 3/4 (1.315)	7.625	2	5.600	5.596	5.589	8° 04'	0.5336	0.5336
8 (1.315)	8.000	2	5.875	5.871	5.864	8° 08'	0.5446	0.5446
8 1/8 (1.315)	8.125	2	5.969	5.965	5.958	8° 12'	0.5556	0.5556
8 1/4 (1.315)	8.250	2	6.063	6.059	6.052	8° 16'	0.5666	0.5666
8 3/4 (1.315)	8.625	2	6.350	6.346	6.339	8° 20'	0.5816	0.5816
9 (1.315)	9.000	2	6.625	6.621	6.614	8° 24'	0.5926	0.5926
9 1/8 (1.315)	9.125	2	6.719	6.715	6.708	8° 28'	0.6036	0.6036
9 1/4 (1.315)	9.250	2	6.813	6.809	6.802	8° 32'	0.6146	0.6146
9 3/4 (1.315)	9.625	2	7.100	7.096	7.089	8° 36'	0.6296	0.6296
10 (1.315)	10.000	2	7.375	7.371	7.364	8° 40'	0.6406	0.6406
10 1/8 (1.315)	10.125	2	7.469	7.465	7.458	8° 44'	0.6516	0.6516
10 1/4 (1.315)	10.250	2	7.563	7.559	7.552	8° 48'	0.6626	0.6626
10 3/4 (1.315)	10.625	2	7.850	7.846	7.839	8° 52'	0.6776	0.6776
11 (1.315)	11.000	2	8.125	8.121	8.114	8° 56'	0.6886	0.6886
11 1/8 (1.315)	11.125	2	8.219	8.215	8.208	9° 00'	0.6996	0.6996
11 1/4 (1.315)	11.250	2	8.313	8.309	8.302	9° 04'	0.7106	0.7106
11 3/4 (1.315)	11.625	2	8.600	8.596	8.589	9° 08'	0.7256	0.7256
12 (1.315)	12.000	2	8.875	8.871	8.864	9° 12'	0.7366	0.7366
12 1/8 (1.315)	12.125	2	8.969	8.965	8.958	9° 16'	0.7476	0.7476
12 1/4 (1.315)	12.250	2	9.063	9.059	9.052	9° 20'	0.7586	0.7586
12 3/4 (1.315)	12.625	2	9.350	9.346	9.339	9° 24'	0.7736	0.7736
13 (1.315)	13.000	2	9.625	9.621	9.614	9° 28'	0.7846	0.7846
13 1/8 (1.315)	13.125	2	9.719	9.715	9.708	9° 32'	0.7956	0.7956
13 1/4 (1.315)	13.250	2	9.813	9.809	9.802	9° 36'	0.8066	0.8066
13 3/4 (1.315)	13.625	2	10.100	10.096	10.089	9° 40'	0.8216	0.8216
14 (1.315)	14.000	2	10.375	10.371	10.364	9° 44'	0.8326	0.8326
14 1/8 (1.315)	14.125	2	10.469	10.465	10.458	9° 48'	0.8436	0.8436
14 1/4 (1.315)	14.250	2	10.563	10.559	10.552	9° 52'	0.8546	0.8546
14 3/4 (1.315)	14.625	2	10.850	10.846	10.839	9° 56'	0.8696	0.8696
15 (1.315)	15.000	2	11.125	11.121	11.114	10° 00'	0.8806	0.8806
15 1/8 (1.315)	15.125	2	11.219	11.215	11.208	10° 04'	0.8916	0.8916
15 1/4 (1.315)	15.250	2	11.313	11.309	11.302	10° 08'	0.9026	0.9026
15 3/4 (1.315)	15.625	2	11.600	11.596	11.589	10° 12'	0.9176	0.9176
16 (1.315)	16.000	2	11.875	11.871	11.864	10° 16'	0.9286	0.9286
16 1/8 (1.315)	16.125	2	11.969	11.965	11.958	10° 20'	0.9396	0.9396
16 1/4 (1.315)	16.250	2	12.063	12.059	12.052	10° 24'	0.9506	0.9506
16 3/4 (1.315)	16.625	2	12.350	12.346	12.339	10° 28'	0.9656	0.9656
17 (1.315)	17.000	2	12.625	12.621	12.614	10° 32'	0.9766	0.9766
17 1/8 (1.315)	17.125	2	12.719	12.715	12.708	10° 36'	0.9876	0.9876
17 1/4 (1.315)	17.250	2	12.813	12.809	12.802	10° 40'	0.9986	0.9986
17 3/4 (1.315)	17.625	2	13.100	13.096	13.089	10° 44'	1.0136	1.0136
18 (1.315)	18.000	2	13.375	13.371	13.364	10° 48'	1.0246	1.0246
18 1/8 (1.315)	18.125	2	13.469	13.465	13.458	10° 52'	1.0356	1.0356
18 1/4 (1.315)	18.250	2	13.563	13.559	13.552	10° 56'	1.0466	1.0466
18 3/4 (1.315)	18.625	2	13.850	13.846	13.839	11° 00'	1.0616	1.0616
19 (1.315)	19.000	2	14.125	14.121	14.114	11° 04'	1.0726	1.0726
19 1/8 (1.315)	19.125	2	14.219	14.215	14.208	11° 08'	1.0836	1.0836
19 1/4 (1.315)	19.250	2	14.313	14.309	14.302	11° 12'	1.0946	1.0946
19 3/4 (1.315)	19.625	2	14.600	14.596	14.589	11° 16'	1.1096	1.1096
20 (1.315)	20.000	2	14.875	14.871	14.864	11° 20'	1.1206	1.1206
20 1/8 (1.315)	20.125	2	14.969	14.965	14.958	11° 24'	1.1316	1.1316
20 1/4 (1.315)	20.250	2	15.063	15.059	15.052	11° 28'	1.1426	1.1426
20 3/4 (1.315)	20.625	2	15.350	15.346	15.339	11° 32'	1.1576	1.1576
21 (1.315)	21.000	2	15.625	15.621	15.614	11° 36'	1.1686	1.1686
21 1/8 (1.315)	21.125	2	15.719	15.715	15.708	11° 40'	1.1796	1.1796
21 1/4 (1.315)	21.250	2	15.813	15.809	15.802	11° 44'	1.1906	1.1906
21 3/4 (1.315)	21.625	2	16.100	16.096	16.089	11° 48'	1.2056	1.2056
22 (1.315)	22.000	2	16.375	16.371	16.364	11° 52'	1.2166	1.2166
22 1/8 (1.315)	22.125	2	16.469	16.465	16.458	11° 56'	1.2276	1.2276
22 1/4 (1.315)	22.250	2	16.563	16.559	16.552	12° 00'	1.2386	1.2386
22 3/4 (1.315)	22.625	2	16.850	16.846	16.839	12° 04'	1.2536	1.2536
23 (1.315)	23.000	2	17.125	17.121	17.114	12° 08'	1.2646	1.2646
23 1/8 (1.315)	23.125	2	17.219	17.215	17.208	12° 12'	1.2756	1.2756
23 1/4 (1.315)	23.250	2	17.313	17.309	17.302	12° 16'	1.2866	1.2866
23 3/4 (1.315)	23.625	2	17.600	17.596	17.589	12° 20'	1.3016	1.3016
24 (1.315)	24.000	2	17.875	17.871	17.864	12° 24'	1.3126	1.3126
24 1/8 (1.315)	24.125	2	17.969	17.965	17.958	12° 28'	1.3236	1.3236
24 1/4 (1.315)	24.250	2	18.063	18.059	18.052	12° 32'	1.3346	1.3346
24 3/4 (1.315)	24.625	2	18.350	18.346	18.339	12° 36'	1.3496	1.3496
25 (1.315)	25.000	2	18.625	18.621	18.614	12° 40'	1.3606	1.3606
25 1/8 (1.315)	25.125	2	18.719	18.715	18.708	12° 44'	1.3716	1.3716
25 1/4 (1.315)	25.250	2	18.813	18.809	18.802	12° 48'	1.3826	1.3826
25 3/4 (1.315)	25.625	2	19.100	19.096	19.089	12° 52'	1.3976	1.3976
26 (1.315)	26.000	2	19.375	19.371	19.364	12° 56'	1.4086	1.4086
26 1/8 (1.315)	26.125	2	19.469	19.465	19.458	13° 00'	1.4196	1.4196
26 1/4 (1.315)	26.250	2	19.563	19.559	19.552	13° 04'	1.4306	1.4306
26 3/4 (1.315)	26.625	2	19.850	19.846	19.839	13° 08'	1.4456	1.4456
27 (1.315)	27.000	2	20.125	20.121	20.114	13° 12'	1.4566	1.4566
27 1/8 (1.315)	27.125	2	20.219	20.215	20.208	13° 16'	1.4676	1.4676
27 1/4 (1.315)	27.250	2	20.313	20.309	20.302	13° 20'	1.4786	1.4786
27 3/4 (1.315)	27.625	2	20.600	20.596	20.589	13° 24'	1.4936	1.4936
28 (1.315)	28.000	2	20.875	20.871	20.864	13° 28'	1.5046	1.5046
28 1/8 (1.315)	28.125	2	20.969	20.965				

# on Unified Screw Thread Standards

threads of a given grade of fit.

In the past, the Bureau of Standards points out, one of the irksome aspects of international trade has been the necessity for supplying and distributing screw thread parts associated with equipment sold by one nation to another. And the question of the availability of such parts has acted as a psychological deterrent on purchases of products from other nations. These limitations on commerce among the U. S., U. K., and Canada now are expected to vanish as the unified standards are acted upon in the coming years by industries of the three nations.

The present accord calls for a continuance of future cooperation in the field of screw thread standardiza-

tion. Such cooperation has two aspects. First, the unification will be extended to other English-speaking nations, all of which use the English system of measurement in manufacture. Second, the development of this and other standards will continue to progress. "Standards are not static," as the Department of Commerce expresses it. "They must keep pace with improvements in materials and methods of production and inspection developed in industry."

The basic mathematical formulas for tolerances and allowances were tentatively agreed upon earlier this year, and the final agreement upon the standards was reached among the representatives of the three nations on November 18, 1948.

Table 3—Limits of size, unified coarse thread series, class 2A external threads, class 2B internal threads<sup>1,2</sup>

SIZES	Threads Per Inch	CLASS 2A SIZES					CLASS 2B SIZES				
		Major Diameter		Pitch Diameter		Minor Diameter	Major Diameter		Pitch Diameter		Minor Diameter
		Max.	Min.	Max.	Min.	Max.	Max.	Min.	Max.	Min.	Max.
1	2	3	4	5	6	7	8	9	10	11	12
		Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
1.1-1.733	54	0.0723	0.0685	0.0623	0.0583	0.0523	0.0503	0.0453	0.0433	0.0383	0.0373
1.1-1.733	48	0.0823	0.0785	0.0723	0.0683	0.0623	0.0603	0.0553	0.0533	0.0483	0.0473
1.1-1.733	40	0.1023	0.0985	0.0923	0.0883	0.0823	0.0803	0.0753	0.0733	0.0683	0.0673
1.1-1.733	36	0.1223	0.1185	0.1123	0.1083	0.1023	0.1003	0.0953	0.0933	0.0883	0.0873
1.1-1.733	32	0.1423	0.1385	0.1323	0.1283	0.1223	0.1203	0.1153	0.1133	0.1083	0.1073
1.1-1.733	28	0.1623	0.1585	0.1523	0.1483	0.1423	0.1403	0.1353	0.1333	0.1283	0.1273
1.1-1.733	24	0.1823	0.1785	0.1723	0.1683	0.1623	0.1603	0.1553	0.1533	0.1483	0.1473
1.1-1.733	20	0.2023	0.1985	0.1923	0.1883	0.1823	0.1803	0.1753	0.1733	0.1683	0.1673
1.1-1.733	18	0.2223	0.2185	0.2123	0.2083	0.2023	0.2003	0.1953	0.1933	0.1883	0.1873
1.1-1.733	16	0.2423	0.2385	0.2323	0.2283	0.2223	0.2203	0.2153	0.2133	0.2083	0.2073
1.1-1.733	14	0.2623	0.2585	0.2523	0.2483	0.2423	0.2403	0.2353	0.2333	0.2283	0.2273
1.1-1.733	12	0.2823	0.2785	0.2723	0.2683	0.2623	0.2603	0.2553	0.2533	0.2483	0.2473
1.1-1.733	10	0.3023	0.2985	0.2923	0.2883	0.2823	0.2803	0.2753	0.2733	0.2683	0.2673
1.1-1.733	8	0.3223	0.3185	0.3123	0.3083	0.3023	0.3003	0.2953	0.2933	0.2883	0.2873
1.1-1.733	6	0.3423	0.3385	0.3323	0.3283	0.3223	0.3203	0.3153	0.3133	0.3083	0.3073
1.1-1.733	5	0.3623	0.3585	0.3523	0.3483	0.3423	0.3403	0.3353	0.3333	0.3283	0.3273
1.1-1.733	4	0.3823	0.3785	0.3723	0.3683	0.3623	0.3603	0.3553	0.3533	0.3483	0.3473
1.1-1.733	3	0.4023	0.3985	0.3923	0.3883	0.3823	0.3803	0.3753	0.3733	0.3683	0.3673
1.1-1.733	2	0.4223	0.4185	0.4123	0.4083	0.4023	0.4003	0.3953	0.3933	0.3883	0.3873
1.1-1.733	1	0.4423	0.4385	0.4323	0.4283	0.4223	0.4203	0.4153	0.4133	0.4083	0.4073
1.1-1.733	1	0.4623	0.4585	0.4523	0.4483	0.4423	0.4403	0.4353	0.4333	0.4283	0.4273
1.1-1.733	1	0.4823	0.4785	0.4723	0.4683	0.4623	0.4603	0.4553	0.4533	0.4483	0.4473
1.1-1.733	1	0.5023	0.4985	0.4923	0.4883	0.4823	0.4803	0.4753	0.4733	0.4683	0.4673
1.1-1.733	1	0.5223	0.5185	0.5123	0.5083	0.5023	0.5003	0.4953	0.4933	0.4883	0.4873
1.1-1.733	1	0.5423	0.5385	0.5323	0.5283	0.5223	0.5203	0.5153	0.5133	0.5083	0.5073
1.1-1.733	1	0.5623	0.5585	0.5523	0.5483	0.5423	0.5403	0.5353	0.5333	0.5283	0.5273
1.1-1.733	1	0.5823	0.5785	0.5723	0.5683	0.5623	0.5603	0.5553	0.5533	0.5483	0.5473
1.1-1.733	1	0.6023	0.5985	0.5923	0.5883	0.5823	0.5803	0.5753	0.5733	0.5683	0.5673
1.1-1.733	1	0.6223	0.6185	0.6123	0.6083	0.6023	0.6003	0.5953	0.5933	0.5883	0.5873
1.1-1.733	1	0.6423	0.6385	0.6323	0.6283	0.6223	0.6203	0.6153	0.6133	0.6083	0.6073
1.1-1.733	1	0.6623	0.6585	0.6523	0.6483	0.6423	0.6403	0.6353	0.6333	0.6283	0.6273
1.1-1.733	1	0.6823	0.6785	0.6723	0.6683	0.6623	0.6603	0.6553	0.6533	0.6483	0.6473
1.1-1.733	1	0.7023	0.6985	0.6923	0.6883	0.6823	0.6803	0.6753	0.6733	0.6683	0.6673
1.1-1.733	1	0.7223	0.7185	0.7123	0.7083	0.7023	0.7003	0.6953	0.6933	0.6883	0.6873
1.1-1.733	1	0.7423	0.7385	0.7323	0.7283	0.7223	0.7203	0.7153	0.7133	0.7083	0.7073
1.1-1.733	1	0.7623	0.7585	0.7523	0.7483	0.7423	0.7403	0.7353	0.7333	0.7283	0.7273
1.1-1.733	1	0.7823	0.7785	0.7723	0.7683	0.7623	0.7603	0.7553	0.7533	0.7483	0.7473
1.1-1.733	1	0.8023	0.7985	0.7923	0.7883	0.7823	0.7803	0.7753	0.7733	0.7683	0.7673
1.1-1.733	1	0.8223	0.8185	0.8123	0.8083	0.8023	0.8003	0.7953	0.7933	0.7883	0.7873
1.1-1.733	1	0.8423	0.8385	0.8323	0.8283	0.8223	0.8203	0.8153	0.8133	0.8083	0.8073
1.1-1.733	1	0.8623	0.8585	0.8523	0.8483	0.8423	0.8403	0.8353	0.8333	0.8283	0.8273
1.1-1.733	1	0.8823	0.8785	0.8723	0.8683	0.8623	0.8603	0.8553	0.8533	0.8483	0.8473
1.1-1.733	1	0.9023	0.8985	0.8923	0.8883	0.8823	0.8803	0.8753	0.8733	0.8683	0.8673
1.1-1.733	1	0.9223	0.9185	0.9123	0.9083	0.9023	0.9003	0.8953	0.8933	0.8883	0.8873
1.1-1.733	1	0.9423	0.9385	0.9323	0.9283	0.9223	0.9203	0.9153	0.9133	0.9083	0.9073
1.1-1.733	1	0.9623	0.9585	0.9523	0.9483	0.9423	0.9403	0.9353	0.9333	0.9283	0.9273
1.1-1.733	1	0.9823	0.9785	0.9723	0.9683	0.9623	0.9603	0.9553	0.9533	0.9483	0.9473
1.1-1.733	1	1.0023	0.9985	0.9923	0.9883	0.9823	0.9803	0.9753	0.9733	0.9683	0.9673
1.1-1.733	1	1.0223	1.0185	1.0123	1.0083	1.0023	1.0003	0.9953	0.9933	0.9883	0.9873
1.1-1.733	1	1.0423	1.0385	1.0323	1.0283	1.0223	1.0203	1.0153	1.0133	1.0083	1.0073
1.1-1.733	1	1.0623	1.0585	1.0523	1.0483	1.0423	1.0403	1.0353	1.0333	1.0283	1.0273
1.1-1.733	1	1.0823	1.0785	1.0723	1.0683	1.0623	1.0603	1.0553	1.0533	1.0483	1.0473
1.1-1.733	1	1.1023	1.0985	1.0923	1.0883	1.0823	1.0803	1.0753	1.0733	1.0683	1.0673
1.1-1.733	1	1.1223	1.1185	1.1123	1.1083	1.1023	1.1003	1.0953	1.0933	1.0883	1.0873
1.1-1.733	1	1.1423	1.1385	1.1323	1.1283	1.1223	1.1203	1.1153	1.1133	1.1083	1.1073
1.1-1.733	1	1.1623	1.1585	1.1523	1.1483	1.1423	1.1403	1.1353	1.1333	1.1283	1.1273
1.1-1.733	1	1.1823	1.1785	1.1723	1.1683	1.1623	1.1603	1.1553	1.1533	1.1483	1.1473
1.1-1.733	1	1.2023	1.1985	1.1923	1.1883	1.1823	1.1803	1.1753	1.1733	1.1683	1.1673
1.1-1.733	1	1.2223	1.2185	1.2123	1.2083	1.2023	1.2003	1.1953	1.1933	1.1883	1.1873
1.1-1.733	1	1.2423	1.2385	1.2323	1.2283	1.2223	1.2203	1.2153	1.2133	1.2083	1.2073
1.1-1.733	1	1.2623	1.2585	1.2523	1.2483	1.2423	1.2403	1.2353	1.2333	1.2283	1.2273
1.1-1.733	1	1.2823	1.2785	1.2723	1.2683	1.2623	1.2603	1.2553	1.2533	1.2483	1.2473
1.1-1.733	1	1.3023	1.2985	1.2923	1.2883	1.2823	1.2803	1.2753	1.2733	1.2683	1.2673
1.1-1.733	1	1.3223	1.3185	1.3123	1.3083	1.3023	1.3003	1.2953	1.2933	1.2883	1.2873
1.1-1.733	1	1.3423	1.3385	1.3323	1.3283	1.3223	1.3203	1.3153	1.3133	1.3083	1.3073
1.1-1.733	1	1.3623	1.3585	1.3523	1.3483	1.3423	1.3403	1.3353	1.3333	1.3283	1.3273
1.1-1.733	1	1.3823	1.3785	1.3723	1.3683	1.3623	1.3603	1.3553	1.3533	1.3483	1.3473
1.1-1.733	1	1.4023	1.3985	1.3923	1.3883	1.3823	1.3803	1.3753	1.3733	1.3683	1.3673
1.1-1.733	1	1.4223	1.4185	1.4123	1.4083	1.4023	1.4003	1.3953	1.3933	1.3883	1.3873
1.1-1.733	1	1.4423	1.4385	1.4323	1.4283	1.4223	1.4203	1.4153	1.4133	1.4083	1.4073
1.1-1.733	1	1.4623	1.4585	1.4523	1.4483	1.4423	1.4403	1.4353	1.4333	1.4283	1.4273
1.1-1.733	1	1.4823	1.4785	1.4723	1.4683	1.4623	1.4603	1.4553	1.4533	1.4483	1.4473
1.1-1.733	1	1.5023	1.4985	1.4923	1.4883	1.4823	1.4803	1.4753	1.4733	1.4683	1.4673
1.1-1.733	1	1.5223	1.5185	1.5123	1.5083	1.5023	1.5003	1.4953	1.4933	1.4883	1.4873
1.1-1.733	1	1.5423	1.5385	1.5323	1.5283	1.5223	1.5203	1.5153	1.5133	1.5083	1.5073
1.1-1.733	1	1.5623	1.5585	1.5523	1.5483	1.5423	1.5403	1.5353	1.5333	1.5283	1.5273
1.1-1.733	1	1.5823	1.5785	1.5723	1.5683	1.5623	1.5603	1.5553	1.5533	1.5483	1.5473
1.1-1.733	1	1.6023	1.5985	1.5923	1.5883	1.5823	1.5803	1.5753	1.5733	1.5683	1.5673
1.1-1.733	1	1.6223	1.6185	1.6123	1.6083	1.6023	1.6003	1.5953	1.5933	1.5883	1.5873
1.1-1.733	1	1.6423	1.6385	1.6323	1.6283	1.6223	1.6203	1.6153	1.6133	1.6083	1.6073
1.1-1.733	1	1.6623	1.6585	1.6523	1.6483	1.6423	1.6403	1.6353	1.6333	1.6283	1.6273
1.1-1.733	1	1.6823	1.6785	1.6723	1.6683	1.6623	1.6603	1.6553	1.6533	1.6483	1.6473
1.1-1.733	1	1.7023	1.6985	1.6923	1.6883	1.6823	1.6803	1.6753	1.6733	1.6683	1.6673

# Equal Emphasis on Producibility

**T**HE factor of "producibility", regarded as "old stuff" in the automobile industry a quarter-century ago, is now fomenting a mild revolution in the aircraft industry. Reason: Air Force has just given it a value of 20 per cent of the total point award in the evaluation of a new warplane design. This places the "new" requirement on an equal footing, percentage-wise, with "tactical suitability" and "engineering", considered heretofore the major competitive items between two or more manufacturers' proposals.

Automobile engineering and production men may smile wryly at this belated recognition of the producibility factor in aircraft on the basis of their experience during World War II in adapting complete aircraft and components to mass production techniques. However, the problem now is not that simple for two reasons: volumes are extremely low and aircraft complexity has increased enormously since the days of the Ford-built Liberator, General Motors-built Avenger, etc.

The aircraft industry has, through the years, produced the first experimental airplane on a "hand-made" basis. The plane was then redesigned and the shop "tooled up" on the basis of the production quantity ordered by the Services; the degree of such redesign and tooling being a direct function of the quantity ordered.

However, the Air Force now wants the airplane designed initially as a high-volume article. It insists that a new aircraft design have a simple configuration, a small number of uniformity of parts, ease of fabrication using readily available tools, ease of equipment installation and assembly, extensive use of standard parts and processes and adaptability to rapid expansion of production.

Not only is the Air Force insisting on these factors in new designs but is studying the redesign of several current types for high volume production. Industrial Planning Division, Air Materiel Command, has allocated \$6,277,916 in six contracts with industry for redesign of high-priority aircraft, engines and propellers to permit rapid increase in their output rates in the event of an emergency. In addition, it has let eight airframe and six engine contracts for studies of the effect of a sudden change to high-volume production on these manufacturers' facilities, equipment, manpower, etc.

## Suppliers Receive Contracts

The new program is not confined to the parent industry and has been extended to suppliers and basic industries. Included among these are: five contracts with Reynolds Metals for development of aluminum

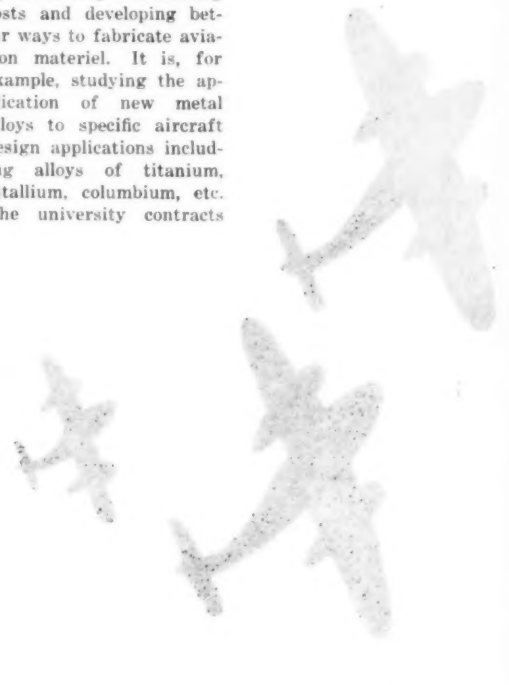
processing methods, including tapered sheets; a series of university contracts for studies of cutting tool processes and new metal alloys; a Thompson Products contract for fabrication of gas turbine blades; a Western Products contract for studies on honeycomb sandwich materials, etc.

These contracts are administered by the Manufacturing Methods Branch, which is charged with responsibility lowering costs and developing better ways to fabricate aviation materiel. It is, for example, studying the application of new metal alloys to specific aircraft design applications including alloys of titanium, vitallium, columbium, etc. The university contracts

for study of metal cutting methods include these materials as well as the more conventional alloys in present use. These cutting methods include studies of methods for approaching zero tolerances, use of coolants and cutting fluids, speeds and rates-of-feeding.

## Substantial Dollar Savings

This branch of the Air Materiel Command Industrial Planning organization has already applied earlier findings to the manufacture of current procurement items and realized substantial dollar savings. For example, a re-examination of a request for additional



# Adopted for New Warplane Designs

Air Force Requirements Include Design Simplification, Uniformity and Standardization of Parts, and Ease of Fabrication for High Volume Production. Program Extends to Suppliers and Basic Industries.



By  
**Robert  
McLarren**

tooling and operation costs submitted by Emerson Electric Co. on its fire-control equipment contract resulted in a saving of \$1,800,000 through application of new methods developed by Manufacturing Methods Branch. Other savings resulting from the use of advanced technique include \$140,000 saved on the production of landing gear struts by Menasco Manufacturing Co. and \$69,918 saved on a subcontract with Ranger Engine Division, Fairchild Engine and Airplane Co.

It is this combination of better manufacturing methods plus simplicity of design that is improving the producibility of military aircraft, and these improvements will find their way directly into commercial applications. Of greater interest to the Air Force, however, is the improved expansibility resulting from this new approach to aircraft design and manufacture. While the dollar savings are important in these days of high costs and record-breaking peacetime military budgets, of greater importance is the ability of the aircraft industry to immediately expand its output in the event of an emergency, at least one lesson learned from World War II.

The application of producibility to design is more

easily said than done, however, and increasingly stringent strength and performance requirements cannot be penalized excessively in the process. Air Materiel Command producibility experts are certain, however, that enormous strides can be made in improving this factor without any significant sacrifice in the strength or performance of the design. They feel that substantial gains can be made merely through the proper shaping of the airplane configuration plus a little thought applied to its structural design.

Simplicity of configuration is of primary importance and cylindrical fuselages, rather than those using compound curves, are favored. The wing center section should have straight leading and trailing edges, rather than a taper, which can be confined to the outer panels. Although tapered wings have chord sections progressively smaller outboard towards the tips, this can be overcome by placing the spars either parallel or at a given distance in inches from the leading and trailing edges. Thus, instead of having 40 or 50 ribs, no two of which are identical, the panel will have 40 or 50 identical rib segments with only the remaining small segment differing from the rib adjacent.

## Reduce Number of Parts

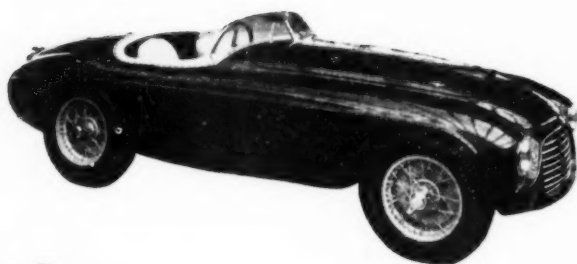
Reductions in the number of parts plays an important role in producibility. Aircraft manufacture has long required "left" and "right" hand parts throughout much of the airframe structure due to the curved wing, fuselage, and empennage assemblies, which require opposite-facing flanges on internal members. This problem can be solved, in part, by the use of fewer internal structural members. Long, straight members can be used to replace numerous canted members. Elimination of splices, built-up assemblies and take-up and adjustment fittings is to be favored. Heavier skin gages can reduce the number and extent of stiffening elements. An extruded I-beam can re-

*(Turn to page 58, please)*





A station wagon has been added to the Fiat 500B line.

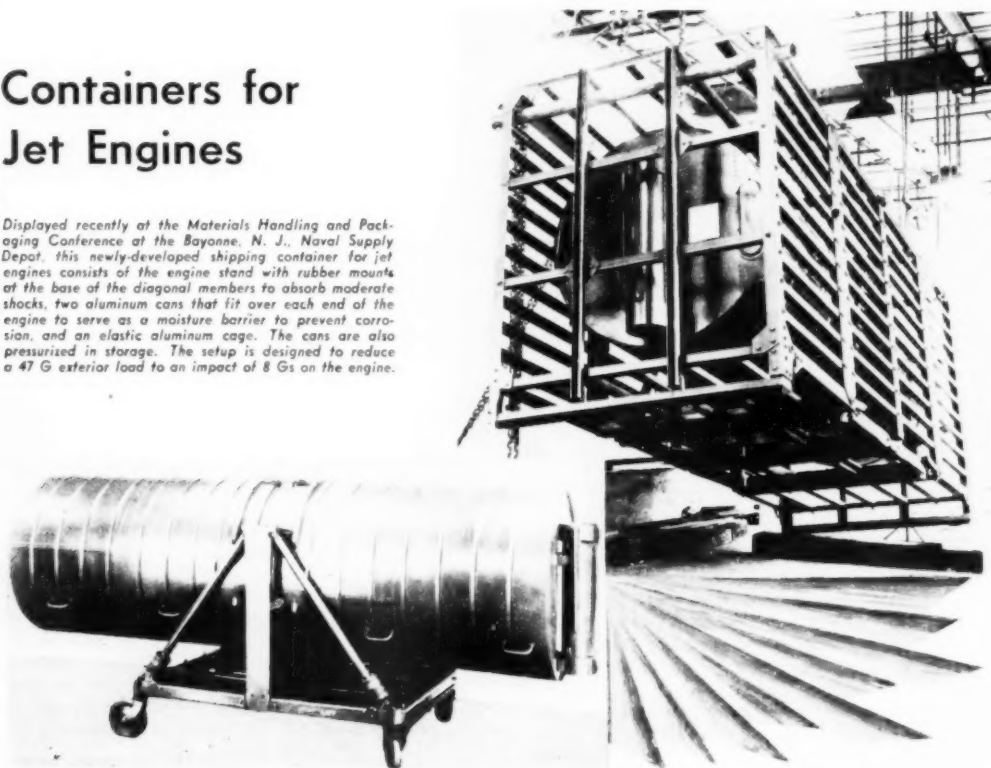


## Italian Sports Cars

In addition to its line of racing cars, Ferrari also is specializing in sports cars such as the one shown above with a body designed by Carrozzeria Touring Co. and powered by a 12-cylinder engine. Note the carburetor air scoop at the top of the hood. A racing version won the recent Paris 12-hour endurance race at average speed of 72.5 mph. The distance was 870 miles.

## Containers for Jet Engines

Displayed recently at the Materials Handling and Packaging Conference at the Bayonne, N. J., Naval Supply Depot, this newly-developed shipping container for jet engines consists of the engine stand with rubber mounts at the base of the diagonal members to absorb moderate shocks, two aluminum cans that fit over each end of the engine to serve as a moisture barrier to prevent corrosion, and an elastic aluminum cage. The cans are also pressurized in storage. The setup is designed to reduce a 47 G exterior load to an impact of 8 Gs on the engine.



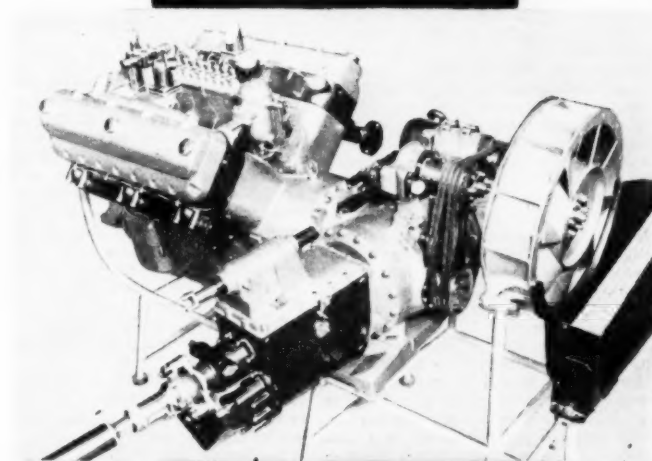
# Italian V-8 Diesel Power Plant for Buses

Overhead valve engine has 647 cu. in. displacement and light alloy cylinder blocks with liners.

**B**UILT by the O. M. Company, of Brescia, Italy, under license from the Swiss Saurer Company, the new Diesel V-8 is intended for rear mounting in chassis-bodies produced under license from the General Aero-coach, of Chicago. The engine has a bore and stroke of 4.33 by 5.51 in., giving a piston displacement of 647 cu in. The two banks of cylinders and the crankcase are a single light alloy casting, with liners. Light alloy is also used for the bevel gear housing, the fan, the transmission cover and the overhead valve covers and oil pan.

The engine has valves in the head, with pushrod operation, is of the direct injection type, with double turbulence, and is stated to develop its maximum horsepower of 130 at 1800 rpm. The pump injector is mounted in the angle formed by the two banks of cylinders and is driven off the forward timing gear. Water pump and generator are mounted on the top of the bevel gear housing with dual belt drive from an extension of the crankshaft.

The clutch is hydraulically operated, with special shock absorbing device. The transmission provides five forward speeds, three having synchromesh. The final drive is by a single reduction rear axle.



## User's Eye View of the

# Materials Handling Industry

By E. L. Bailey

Staff Electrical Engineer  
Chrysler Corporation

**M**ATERIAL handling in the automobile industry is very similar to that of any other large manufacturing concern. It is decidedly big business to coordinate the movement of two million ton-miles of manufacturing material within one's plant. An examination of the general plan of production reveals some particular problems.

Our final product, an automobile running under its own power, is the result of manufacturing and assembling thousands of parts, many of which, such as the engine, are made completely in our plants from the raw materials. Other parts or sub-assemblies are received at our plants practically ready for assembly on the car. The materials range from iron and steel to fabrics, glass and rubber and each material in the correct form and quantity must be available at the final assembly line at the right time.

Many forms of electrically operated devices (cranes, hoists, conveyors, jitneys) play a very important part in all of this material handling. As a freight car door is pryed open, either an electric jitney truck speeds into the car and picks up the skids or pallets of material or a group of men proceed to hang the parts onto a motor-driven continuously moving chain. In either case, the car is quickly unloaded and the material stored away. In some cases where the supply can be regulated to a sufficient nicety the conveyor itself becomes the storage area.

The entire requirements for a suitable period of time, say one-half day, can be stored on the conveyor which, of course, is routed to make delivery of the parts at the proper point on the assembly line. The drive for such a conveyor is a simple one-speed design moving only fast enough for good unloading conditions.

A railroad car or truck may contain heavy castings from the foundry division which will be rushed to the machine shop where all of the many machining operations are carried on. The castings move forward on a conveyor of some sort, a roller, a chain or a slat, usually electrically propelled. They are never manually lifted. When

lifting is required, an electric hoist is located at a proper point with a special fixture which makes handling easy and accurate. After an engine block casting, for example, is machined, it is placed on a final engine assembly conveyor. This is a form of continuous bench, on either side of which will be skids of parts properly located for assembling at the right time and place or some particular part may be brought up to the engine assembly conveyor by another overhead chain conveyor, thus delivering the material as required.

Each item of sub-assembly, such as the rear axle, the wheels and tires, the gas tank, the seats and the instrument board, have their own little area of manufacture and sub-assembly. Even small parts are generally assembled on a conveyor of some sort, often a continuous bench belt type arrangement, a carousel or a series of stations along a conveyor.

The basis of manufacture is obvi-

ously an order for an automobile. This order, after proper editing, is sent to a point in the manufacturing unit where central control of the program is set up. Here there is installed a teletype or telautograph which is connected by wire to every principal assembly department so that the central control can issue orders to everyone concerned regarding each automobile.

### Sequence Routing Plan

The system utilized might be called a sequence routing plan. Approximately two weeks before actual construction on the car assembly begins on an order, the chief dispatcher sets up his schedule for cars to be built that day. A sequence number is assigned to each order, beginning with No. 1 as the first car that is to be built that day, then No. 2, etc. Each sub-assembly supervisor then must prepare, sometime during the next two weeks, the car parts for that particular run. Further, he must see that his orders follow on the conveyor in the proper sequence of that day and every day. By means of this control and the coordinating of all conveyors, the right

(Turn to page 67, please)

## Aluminum Replacement Fenders for Pontiacs

**A** RECENT issue of the *Pontiac Service Craftman News* highlights a development of more than passing interest to the industry and service men. Unquestionably because of the continuing steel shortage Pontiac is making available a limited number of aluminum rear fenders for service replacement on 1942-46-47-48 models. These fenders carry the same part numbers as steel fenders and are now stocked in GMPD warehouses. Being coated with a zinc chromate prime applied over Bonderite, the light green color and relatively light weight make them easily identified.

Since these fenders require special treatment when painting to body color in the field, Pontiac has issued the following instructions:

1—Remove all dirt, grease, finger marks, etc., and apply either duPont 65-1051 gray or 65-1052 red oxide

primer surfacer or their equivalent, to the top and underside surfaces.

2—Then apply color coats in accordance with standard practice.

3—Apply a coat of asphalt-base sheet metal deadener approximately 1/32 to 1/16 in. thick to the underside of the fender.

When installing these aluminum fenders special fastenings must be used. Pontiac recommends the exclusive use of cadmium plated or zinc plated bolts, nuts and washers that have been painted with primer. This procedure is necessary in order to prevent corrosion wherever steel parts contact aluminum.

When making paint repairs on aluminum fenders where the finish has been removed to the bare metal the following procedure is recommended:

1—Metal should first be thoroughly  
(Turn to page 67, please)



Crosley's "new look" in grille and hood treatment with lamps submerged in fenders.

## '49 Crosley

**F**OR 1949, Crosley cars will feature new styling, added interior appointments and important mechanical changes. Compression ratio of the Crosley engine has been increased to 7.8 to 1, which

is said to improve gasoline mileage by 10 per cent. Other changes include the installation of valve rotators on the exhaust valves, oil-bath air cleaner, four-ring pistons with top ring chromium plated, spiral bevel gears on the overhead camshaft and tower shaft, and ball bearing fan.

The following prices for Crosley passenger and commercial cars are as listed at the Marion, Ind., assembly plant: Deluxe sedan, \$899; club convertible, \$899; station wagon, \$929; panel delivery truck, \$879; and pickup truck, \$849.



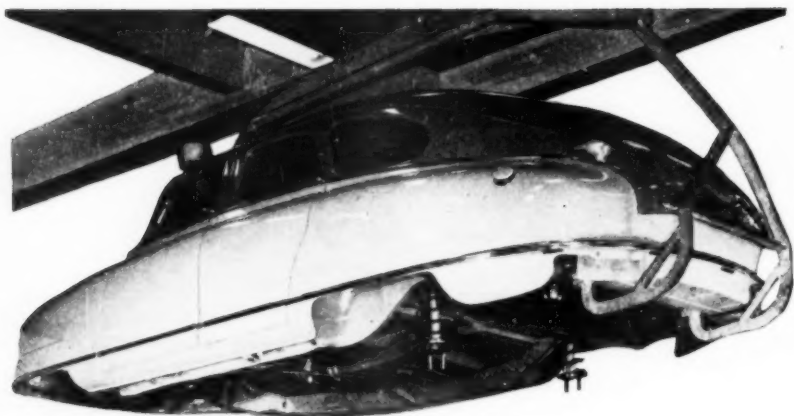
Above is the new deluxe sedan, replacing standard sedan, features improved interior and exterior styling and appointments.



New Crosley quarter-ton pickup is shown above.



Shown at the left is the restyled club convertible. Among its new interior appointments is red upholstery.



## Significant Developments Trends in Materials

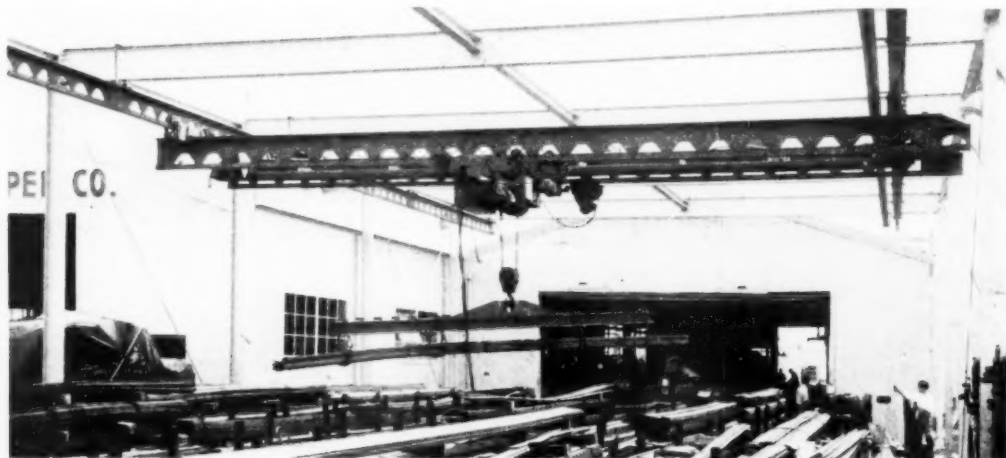
**T**HE Third National Materials Handling Exposition to be held in Philadelphia, January 10-14, will display the very latest models in all types of materials-handling units. In the past, most of the exhibits covered such units as fork trucks, lift trucks, individual floor trucks, etc., but very little in the way of continuous conveyors. This year, the conveyor companies manufacturing unit conveyors such as portable

loaders, portable inclined belt conveyors and similar units will display their merchandise, and the continuous conveyor companies will have more exhibits.

Last year a few of the conveyor companies had model displays, as well as full scale operating units. More of this type of equipment will now be presented, along with many new accessories for cranes, trailers, trucks, fork trucks, etc.

The greatest development in materials handling in the past few years has been the application of the

*Underslung, double trambeam crane in supply yard of spring manufacturer.*





As a special editorial feature preliminary to the National Materials Handling Exposition, beginning here **AUTOMOTIVE INDUSTRIES** presents three timely articles on trends in materials handling equipment and its application in the automotive industries, descriptions of new equipment to be announced by manufacturers at the show, and a list of exhibitors on later pages.

**NATIONAL  
MATERIALS HANDLING  
SHOW**  
PHILADELPHIA--JAN. 10-14

By Matthew W. Potts

Materials Handling Consultant

# and Handling

fork truck to unit load handling, and this was fully portrayed in last year's National Materials Handling Exposition at Cleveland, from the handling of raw materials, through production, and shipment to the ultimate consumer. This year, even more stress will be laid on this important phase of materials handling, and readers of **AUTOMOTIVE INDUSTRIES** should be vitally interested in the equipment which will be on display, such as fork trucks with grab accessories, boom cranes, etc., as well as various types of pallets.

## A Preview of the Materials Handling Show

A number of manufacturers have started to use the pallet system in production, and have made remarkable studies of this system within their own production plants. Other manufacturers in the automobile industry have palletized materials or made up unit loads by means of strapping, and specially designed packaging, so that the unit can be picked up by the fork truck, and handled through several operations, including shipment, by motor truck over the highway, and by common carriers such as railroads and barges, and delivered to the warehouse and production lines in this unit load form.

This is not an unproven experiment, but it is one that was developed prior to the war, with remarkable success. For example, the General Electric Co. at

(Turn to page 70, please)

*Axle shafts, housings, and small parts are handled daily by industrial trucks in large quantities at this manufacturing plant.*



## The Importance of

# Materials Handling in

**M**ATERIALS handling came of age in the postwar era. Throughout the automotive industries materials handling—in all its ramifications—has been made an integral part of the production process, sharing the importance of the machine in mass production. With the emergence of this philosophy materials handling combines with the machine to produce the cyclic, rhythmic pulse and smooth flow so essential to the success of mass production processes.

In one form or another the plants of the automobile industry utilize almost every type of materials handling device known to the art. Some of the most common applications are:

Gravity roller conveyors.

Monorail conveyors.

Flush-floor type assembly conveyors.

Table-height power driven assembly conveyors.

Fabric, rubber and metal belt conveyors.

Chip conveyors.

Transfer mechanism.

Hoists and cranes.

Industrial trucks of specialized types.

Palletizing techniques.

Power driven merry-go-round conveyors for assembly.

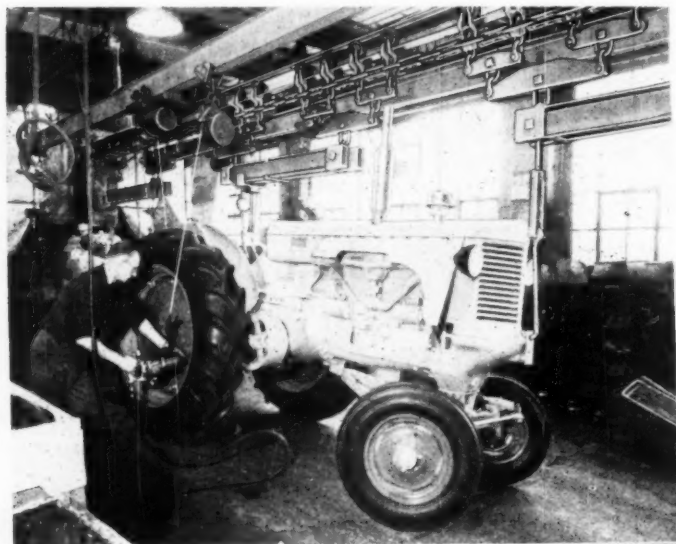
Portable flight conveyors.

Magazine feeds for machines.

Automatic loading and unloading devices for machinery.

This list doubtless could be extended almost indefinitely if attention were given to the variations in design and function of materials handling devices in the gamut of large and small plants. The high-spotting of exhibits at the Show in Philadelphia should go far to provide the best picture of what is commercially available.

It is of interest, however,



Elaborate overhead conveyor and hoist equipment is used here to move tractors along assembly line. At this point wheels with tires are installed after trip through drying oven.



Stacking frames by the thousands.

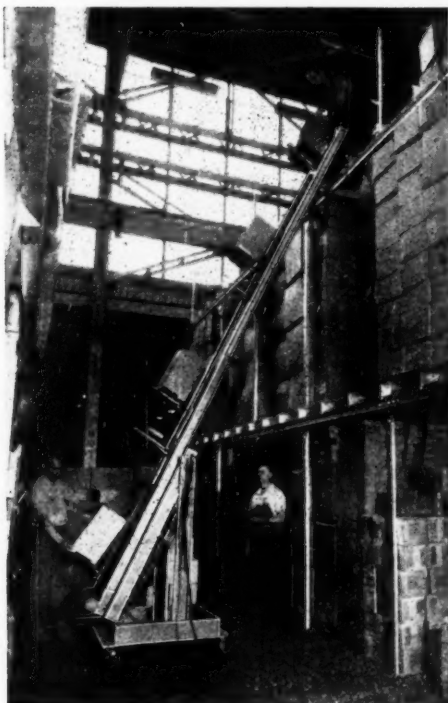
# Mass Production

NATIONAL  
MATERIALS HANDLING  
SHOW

PHILADELPHIA -- JAN. 10-14

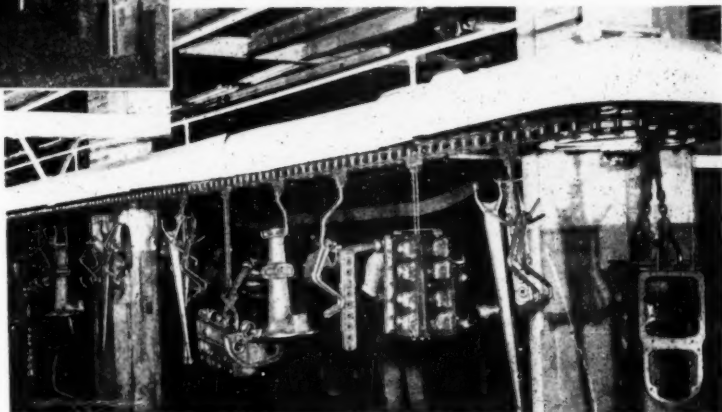
Great Variety of Equipment and Techniques Used by Automobile Companies and Parts Manufacturers. Automatic Handling of Stampings and Other Innovations are Described in this Article.

By  
Joseph  
Geschelin



Latest equipment facilitates tiering at automobile company's parts depot.

Conspicuous at automobile plants is the flow of parts on miles of monorail conveyor line.

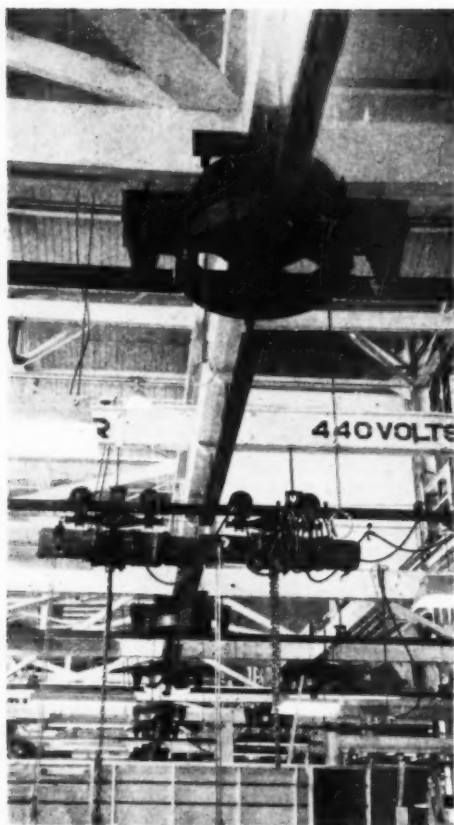


to review the progress made in the automotive industries since the end of the war and to indicate the probable trends. Perhaps the most striking innovation is found in the plants of Ford Motor Co. They call it "automation". And endless variety of combinations of ingenious mechanical movements has made possible the application of automation in the huge press shop at the Rouge.

Here they have self-contained lines for each stamping. Stampings are withdrawn from the first operation draw press by means of a large "iron hand" (see page 48, Dec. 1 issue of *AUTOMOTIVE INDUSTRIES*), which is actuated and controlled by a suitable electric circuit. Other devices are designed to turn stampings over, if this is required for the next operation, and transfer them into the next press. Where the forming operations are followed by welding, as in the case of body stampings, the welding machines are arranged in the same line and the stampings fed through the welders by means of a transfer rail mechanism.

The elimination of manual handling is not unique

(Turn to page 78, please)



Special overhead handling system used in fabricating fighter plane crew nacelle.

**M**ETHODS of handling raw and finished materials in industrial plants may vary in so many aspects that they should be treated as major problems and should be analyzed by making a detailed study of each individual case. Dealers and manufacturers of handling equipment should have the answers to a great many of these problems, but being in the market to sell their equipment, may overlook very important factors in their sales approach by not weighing carefully the following factors and problems as they appear to the aircraft plant engineer or works manager:

- A. Nature of material or parts to be handled.
- B. Must the surface be protected?
- C. Is it effected by vibration or rough handling?
- D. How often or with what frequency is this material moved?
- E. Will it save time?
- F. With the above knowledge, can we afford to spend (x) dollars?
- G. Other factors for consideration may be:
  - (1) Condition and type of floor.

## Major Factors in Materials

By G. E. Musk,

Plant Engineer

and J. Nelson,

Chief Plant Engineering Draftsman  
Northrop Aircraft, Inc.

- (2) Arrangement of plant equipment.
- (3) Construction of building.
- (4) Distance traveled.

With the foregoing outline as a basis, we now can launch into a more detailed discussion of material handling and taking these factors as noted we can then arrive at certain conclusions.

### (A) Nature of Materials or Parts to be Handled.

The hauling of aircraft parts in and about the factory area is a constant problem to the plant engineering department, and before the engineer can make a comprehensive study, again it becomes necessary to break this factor down as follows:

1. Are the parts fragile?
2. Nature of materials or parts (light or heavy).
  - a. Will parts dent of their own weight due to insufficient support structurally?
3. Shape and size.
4. Quantity to be moved in one 8-hour day.

With this information we can determine if the handling device should be of the overhead crane or monorail type, the underneath type such as drag-link chain, or pullbar construction, or whether it should be a dolly type carrier made of steel or wood with solid or pneumatic wheels, and whether or not the supports of the fixture should be padded.

The aircraft industry is unique in that the materials and the parts handling, in most instances, are not of a standard nature or customary procedure, so each specific case must be analyzed and then more often than not, it becomes necessary to make a special handling device which can not be procured as a standard item from the manufacturer. Because the item is special, and because the manufacturer is busy making standard items and does not have shop time for the manufacturing of special equipment, it becomes necessary for the engineers to design these fixtures and have them fabricated in their own shops.

In the design of the fixtures or pieces of handling equipment, we in the aircraft industry are on the constant alert to see that no strains are transferred into the part being handled. This necessitates the design

Selecting

NATIONAL  
MATERIALS HANDLING  
SHOW

PHILADELPHIA -- JAN. 10-14

# Handling Equipment for Aircraft Plant Operation

of specially contoured or cotton webbed slings.

## (B) Protection of Surfaces.

Those who are familiar with our industry are aware of the losses produced by scratched surfaces, so it becomes one of the prime factors of material handling. No inspector will pass any materials, parts, or sub-assemblies when there is evidence of scratches on the surface. Each year thousands of parts and dollars are lost due to careless and improper handling throughout the industry.

## (C) Vibration or Rough Handling.

In making a device for handling assemblies, it is necessary to ascertain its total weight, center of gravity, and where best to support this weight, and the size and number of the supports needed to handle the parts. Aircraft assemblies, as a whole are light, bulky and very peculiar in their design, and in many cases it is next to impossible to handle the part so that damage is not incurred.

## (D) Volume and Frequency of Handling.

Very much depends on the volume and the frequency of parts handling in determining how much can be spent for mechanized conveyors and/or motorized equipment. Should the aircraft industry as a whole ever receive large contracts for given models of uniform size, it would be the signal to mechanize the handling system to match those of the automobile industry. But until the industry is stabilized, the material and parts handling will have to follow very much the same pattern as now practiced. A limited number of aircraft plants are continuing to build approximately the same size aircraft that they did during the war. Consequently they are in a position, with moderate safety, to mechanize their plants with drag-line conveyor systems and overhead cranes to handle

their parts and assemblies. However, there are the other plants that during the war built planes of moderate length, wing-span and weight, that are now building planes many times larger than their previous contracts, and they are finding their handling systems, conveyors and equipment, including their buildings, inadequate in size, and location for their present work. Because of the limited size of their current contracts it is not justifiable to increase or change their methods of material handling.

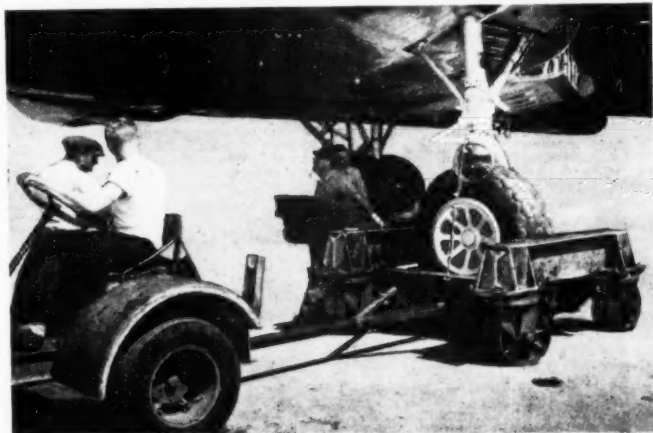
## (E) Will it Save Time?

We are all agreed that most handling gear is a time saver. However, should a labor or a time-saving device be used infrequently and thereby occupy valuable floorspace and become an obstacle in the way of other operations, it would soon off-set the saving in the first instance and become a liability.

## (F) How Much Can Be Spent for Handling Equipment?

Here again a detailed analysis must be made regarding volume versus production rate to ascertain how much can be spent on a given contract to accomplish the most with the least amount of investment or

(Turn to page 74, please)



One of the dollies built for moving Flying Wing B-35 bombers.



# Exhibitors at the

## Third Annual Materials Handling

### Exposition—Convention Hall

#### Philadelphia, January 10-14, '49

**NATIONAL  
MATERIALS HANDLING  
SHOW**  
PHILADELPHIA—JAN. 10-14

EXHIBITOR	BOOTH NO.	EXHIBITOR	BOOTH NO.	EXHIBITOR	BOOTH NO.
Acme Pallet Co., Inc.	22	Harry J. Ferguson Co.	136	Patron Transmission Co.	19
Acme Steel Co.	705	Flow	56	Penton Publishing Co.	501
Acorn Wire and Iron Works	415	Fibrel Specialty Mfg. Co.	127	Peaco Products Co.	520
Addison Semmes Corp.	611			Pittsburgh Steel Products Co.	511
Aerol Co., Inc.	411	The Garlock Packing Co.	524	The Polter Corp.	816
Aerquip Corp.	110	General Electric Co.	733	The Powell Pressed Steel Co.	512
Albion Industries, Inc.	101	The Geneva Metal Wheel Co.	302		
Alvey Conveyor Manufacturing Co.	202	Gerlinger Carver Co.	720		
The Alvey Ferguson Co.	142	A. J. Gerrard & Co.	518	Rack Engineering Co.	805-A
American Engineering	109	Getman Brothers	131	Railway Age	6
American Machine & Foundry Co.	322	Globe Hoist Co.	216	Rapids-Standard Co., Inc.	112
American Monorail Co.	326	Gould Storage Battery Corp.	728	The Ready-Power Co.	435
The American Pulley Co.	403	J. W. Greer Co.	315	Re-Bo Manufacturing Co., Inc.	407
American Society of Mechanical Engineers	132	Gummed Industries Association	232	Revolver Corp.	613
American Steel and Iron Works	719			The Richardson Allen Corp.	319
American Warehousemen's Assoc.	123	Handling Devices, Inc.	320	Richards-Wilcox Manufacturing Co.	321
Anthony Co.	121	H. G. Hanline Co.	419	Robbins & Myers, Inc.	133
Arrow Products	46	Harnischfeger Corp.	425	John A. Roebing Sons Co.	124
Atlantic Distributors, Inc.	44	The Harrington Co.	303	The Ross Carrier Co.	617
Audubon Wire Cloth Corp.	416	The Hertner Electric Co.	224	Rotary Lift Co.	148
Automotive Industries	32	Fred Hill & Son Co.	715	Round Bound & Son	215
Automatic Transportation Co.	524	The Frank G. Hough Co.	606	Rowe Methods, Inc.	404
Baker Industrial Truck Div., Baker-Rauland Co.	608-B	Hydraulic Equipment Co.	721	Ruger Equipment Co., Inc.	301
William Bal Corp.	609	Hyster Co.	425		
The Ballinger Associates	824	Ideal Stencil Machine Co.	4	Saginaw Products Corp.	146
		Industrial Equipment Co.	413	Schweitzer-Cummins Co.	337
Barber-Greene Co.	830	Industrial Tire & Wheel Co., Inc.	46	Sermat Conveyor Corp.	401
Barrett-Cravens Co.	331	Industrial Washing Machine Corp.	336	Service Caster & Truck Corp.	520
The Bassick Co.	408	Inland Wire Products Co.	311	Service Supply Co.	729
Bell Aircraft Corp.	123	Inley Manufacturing Corp.	709	Sherman Paper Products Corp.	115
Bentow Manufacturing Co.	103	Ironbound Box & Lumber Co.	507	Shingle & Gibb Co.	818
Better Packages, Inc.	103	Island Equipment Corp.	207	Signode Steel Strapping Co.	708
Bond Foundry & Machine Co.	103			Silent Hoist & Crane Co., Inc.	623
Boasworth Mfg. Co.	102	The Joyce-Cridland Co.	144	The Siskraft Co.	47
Brainard Steel Co.	505	Kalamazoo Manufacturing Co.	334	Skarnes Engineering & Supply Inc.	819
The Buda Co.	410	Kayel Products Corp.	36	Speedways Conveyors, Inc.	201
E. W. Buschman Co.	509	Keen Manufacturing Co.	104	Stahmer Supply Co.	118
Butler Bin Co.	316			Standard Conveyor Co.	706
		The Lanham Co.	510	The Stanley Works	12
C & D Batteries, Inc.	812	Lansing Co.	40	Star Electric Mfg. Co.	13
C. I. T. Corp.	804	Lansing Industrial Sales Co.	21	Steel Parts Motor Co.	120
Caster & Floor Truck Manufacturers' Assoc.	417	R. B. Latch Engineering Co.	18	Steels Engineering Products Ltd.	409
Chilton Company, Inc.	1	R. G. LeTourneau, Inc.	809	Sterline Bolt Co.	406
Chisholm-Moore Hoist Corp.	828	G. R. Lewis Co.	701	Stevens Appliance Truck Co.	49
City Machine and Wheel Co.	405	Lewis-Shepard Products, Inc.	625		
Clark Equipment Co., Clark Tractor Div.	526	Lift Trucks, Inc.	702	Thermoid Co.	528
The Cleveland Wire Spring Co., Div. of Reynolds Spring Co.	145	Lull Manufacturing Co.	723	The Thew Shovel Co.	423
Coffing Hoist Co.	54	Lyon-Raymond Corp.	710	Thomas Truck & Caster Co.	106
Colson Equipment & Supply Co.	313			Toledo Scale Co.	412
Comet Manufacturing Co., Inc.	54	McGraw-Hill Publishing Co.	607	Towmotor Corp.	432
Conco Engineering Works	825	Magnesium Co. of America	621	Tract-R-Lift Corp.	735
Ira L. Conkline Co.	51	Manning, Maxwell and Moore	726	The Traffic Service Corp.	85
Conover Mast Publications, Inc.	27	Mansaver Industries, Inc.	14	Transit Sales Corp.	402
Conveyor Specialty Co., Inc.	302	Marsh Stencil Machine Co.	29	Triangle Equipment Co.	137
H. W. Crenger Manufacturing Co.	314	Material Handling Institute	126	Truck-Man, Inc.	127
Crecent Truck Co.	138	May-Fran Engineering, Inc.	628	Truseon Steel Co.	427
		Mechanical Handling Systems, Inc.	721		
Darnell Corp.	15	The Mercury Mfg. Co.	324	The Union Metal Mfg. Co.	620
Dempster Brothers, Inc.	328	McGill Brothers	318	Union Steel Products Co.	128-B
Diagraph-Bradley Industries, Inc.	310	Midwest Pallet Corp.	114	Unistrut Products Co.	116
Divine Brothers Co.	519	Modern Industry	304	Unit Crane & Shovel Corp.	213
Drake, Startzman, Sheahan, Barclay, Inc.	25	Modern Materials Handling	28	U. S. Steel Corp.	140
		Monarch Rubber Corp.	32	Unit Manufacturing Co.	3
Economy Engineering Co.	312	The Monroe Co., Inc.	309	Universal 1-Way Pallet Co.	53
Thomas A. Edison, Incorporated, Edison Storage Battery Div.	420	Monroe Auto Equipment Co.	304		
The Electric Industrial Truck Assoc.	832	The Moto-Flow Co.	217	Wayne Crane Division, American Steel	716
The Electric Products Co.	614	Motor Generator Corp.	823	Dredge Co., Inc.	421
The Electric Storage Battery Co.	808-A	The Multistamp Co., Inc.	804	Jervis B. Webb Co.	514
Elizabeth Iron Works, Inc.	823	National Metal Edge Box Co.	718	Weber Addressing Machine Co.	48
The Elwell-Parker Electric Co.	615	National Pallet Corp.	108	Wehle Conveyor Co.	418
Equipment Manufacturing, Inc.	37	National Wooden Box Association	601	The Wellington Machine Co.	51
The Erie Enameling Co.	35	The New Britain-Gridley Machine Division	128-A	West Bend Equipment Corp.	122
Euclid Crane & Hoist Co.	732	Nutting Truck & Caster Co.	333	Westinghouse Electric Corp.	130
				Whiting Corp.	401
Fab-Weld Corp.	727	Orangeville Mfg. Co.	622	The Wilkie Co.	332
The Fairbanks Co.	105	Ortis Elevator Co.	431	Wilshire Power Sweeper Co.	16
Faultless Caster Corp.	514	Pacific Air motive Corp.	817	Wirebound Box Manufacturers Assoc., Inc.	223
Federal Telephone and Radio Corp.	712	Pacific Chain & Manufacturing Co.	117	L & H Wood Manufacturing Co.	39
		Pallet Sales Corp.	26	Wood Pallet Co., Inc.	31
				Wright Hoist Division, American Chain & Cable Co.	306
				The Yale & Towne Manufacturing Co.	521
				Paul O. Young Co.	15

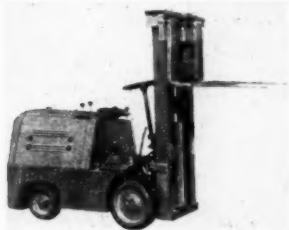
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NATIONAL  
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SHOW  
PHILADELPHIA--JAN. 10-14

### MH-1—New Model Industrial Trucks

Models of equipment to be shown at the Materials Handling Show by the Buda Co., Harvey, Ill., include a Buda-Hebard 5000 lb fork truck, Buda model FH platform type Chore Boy, and Buda-Hebard model H-120 heavy duty tractor.



Buda-Hebard Shop Mulift 5000 lb capacity fork truck, model F-50

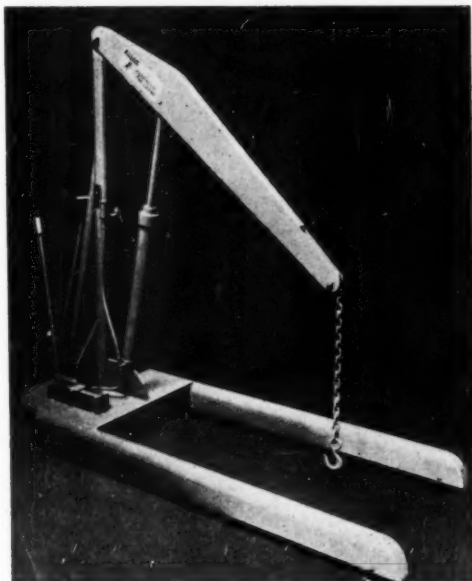


Buda Chore Boy 2000 lb capacity platform truck, Model FH

The 5000 lb fork truck, gasoline-powered model F-50 "Shop Mulift" is rated at 20 in. from heel of forks and has a telescoping lift of 110 in. Features are unobstructed vision when travelling with load and a free lift of 55 in. with overall height of 83 in.

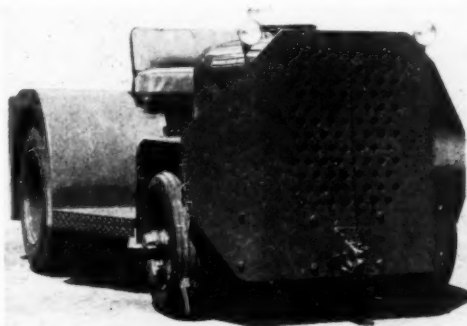
The 2000 lb platform truck Buda

Ruger one-ton hydraulic floor crane, model HP-18



model FH Chore Boy has offset driver seat and bumper to facilitate handling pipe, steel rods and other long material. When driver leaves the seat a brake automatically applies itself. Power is supplied by a 2-cyl. air-cooled engine developing truck speeds up to 12 mph.

The H-120 heavy duty tractor, latest in the H series of "Shop Mules", is engineered for tough hauling jobs, pushing or pulling. Model H-120, powered by International Harvester GRD-233 six-cyl motor truck engine, develops 12,000 lb drawbar effort. Length less coupler is 120 in.; height 60 in.; width 86 in.; turning radius 144 in.; and towing capacity 240 tons.



Buda-Hebard heavy duty tractor, model H-120

### MH-2—Three Hydraulic Floor Cranes

At the National Materials Handling Exposition in Philadelphia the Ruger Equipment Co., Inc., Cleveland, Ohio, will feature three new hydraulic floor cranes—a one ton, three ton, and half ton. On these models a double-acting variable-ratio pump raises the load with effort proportioned to the weight of the load.

By turning the pump handle to right or left a fulcrum block is raised or lowered on the threaded pump handle shaft. This regulates the pumping effort required so that any load up to capacity can be lifted with ease. The load is lowered by a fine-threaded release valve for fast or slow lowering or positive hold at any desired height. On the three ton crane an extension boom is optional equipment, and a transmission attachment is optional extra equipment. Extra lift-and-lower stability is provided by automatic "no tip" stabilizers, under outer body frame.

The new half ton crane features a double-acting hand pump, ball bearing load-carrying and caster wheels, and a self-contained telescoping three-position boom extension.

### MH-3—Tilt-Type Stacker; Push-Pull Attachment

A new tilting type Transtacker including the suspended fork feature of an earlier model will be shown for the first time by the Automatic Transportation Co., Chicago, Ill., at the National Materials Handling Exposition in Phila. The light weight (3200 lb) battery-operated machine is available in either

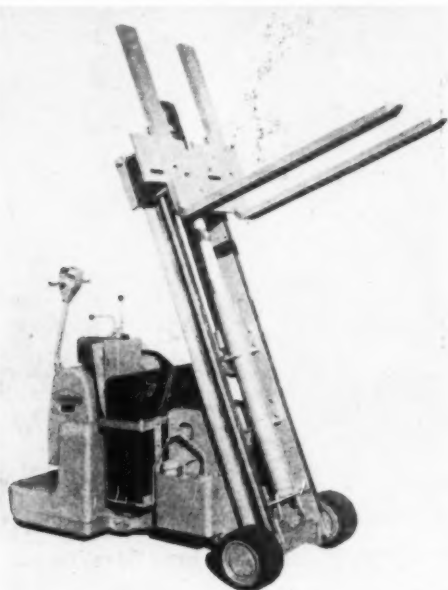
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**NATIONAL  
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PHILADELPHIA--JAN. 10-14

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Automatic new tilting  
type Transtacker

telescopic or non-telescopic models. Backward tilt is 21 deg for safe cradling of the load, and forward tilt is five deg for simplified load spotting. Overall height is 79 in. for clearance through box cars and standard seven-foot factory doors. Capacity is 2500 lb for a 36-in. load and 2000 lb for a 48-in. load. The Transtacker has high pressure hydraulics, fork truck type counterweighting, and a non-skid drive tire and is powered by a standard 11-plate battery.

Likewise to be displayed is a new push-pull attachment developed for use



Automatic push-pull fork truck attachment eliminating use of pallets

on Skylift electric fork trucks which permits carrying and stacking of material without use of pallets. Special heavy corrugated paper sheets replace the pallets. The load, placed on the sheets, is grasped by the attachment and pulled into carrying position. At the stacking area load and paper are lifted in standard fork truck manner and pushed into the desired position.

### MH-4—New Fork Lift Trucks

Nine basic machines, eight of them fork-lift trucks, will constitute the major portion of the exhibit of the Industrial Truck Division of the Clark Equipment Co., Battle Creek, Mich., at the Third National Materials Handling Exposition, Phila., Jan. 10-14, 1949.

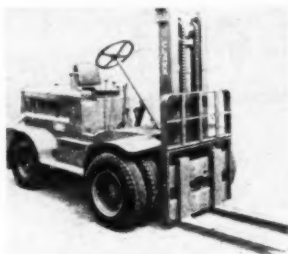
New basic models of fork trucks scheduled for demonstration are the Yardlift 60, "big brother" of the Yardlift-20 and the Yardlift-40 introduced at the First and Second National Materials Handling Expositions respectively; and the redesigned towing tractor, Clarkat-26. Two of the fork lift trucks will be

of the electric battery-powered variety while six others, and the towing tractor, will be gas-powered.

Six of the attachments to be shown eliminate entirely, or minimize, need for the conventional pallet. They are the Clark Pul-Pac, which utilizes an expendable load-base resembling a sheet of cardboard; the universal cotton



Clark electric battery-powered Clipper model equipped with new barrel squeezer-up-ender



Clark gas-powered Clipper model equipped with Clark Hi-Lo-Stack attachment—collapsed height 83 in., maximum lift 130 in., free lift 62 in.

clamp, the concrete-block forks and three different barrel-handling devices.

Machines to be shown and demonstrated are:

Utilitrac-6025 equipped with 112 in. lift, 42 in. forks, solid tires, 48 in. load-safety rack and condensing muffler.

Carloader-4024, 120 in. lift; equipped with standard Pul-Pac attachment, condensing muffler, solid tires and overhead guard.

Yardlift-60 equipped with 112 in. lift, 42 in. standard forks, side-shifter, pneumatic tires and condensing muffler. (Interchangeable with the standard forks will be the model 33 Schmidgall forks for handling concrete blocks.)

Elec-Clipper-2024 equipped with 124 in. lift (less forks), solid tires and Clark's brand-new squeezer-upender for handling barrels.

Clipper-2015 equipped with 130 in.

Hi-Lo Stack 30 in. standard forks, Innacush tires and condensing muffler. (The Exposition marks first public showing of this Hi-Lo Stack on the Clipper-2015.)

Elec-Loader-4015 equipped with 130 in. Hi-Lo Stack, 48 in. rack, 36 in. forks, and solid tires, and provided with new reduced turning radius.

Trucloder equipped with 84 in. lift, 24 in. forks, solid tires and condensing muffler.

Clarkat-26 in the new design featuring narrow steering axle and Innacush tires on the steering wheels, and pneumatic tires on the drive wheels.

Clipper-2015 equipped with Clark's universal cotton clamp, 96 in. lift, 30 in. forks interchangeable with clamp arms; Innacush tires, water muffler and pre-air cleaner.

### MH-5—Gas Powered Materials Handling Truck

The "Load Dispatcher" materials handling truck to be on exhibit by the Schwitzer-Cummins Co., Indianapolis, Ind., features addition of a bumper pusher plate around the front part of the power plant wide enough to register with almost any materials handling vehicle to be pushed. The Dispatcher is made in four types, two of which are hydraulic pump equipped. These lift loads on pallets or skids respectively. The third type has a fixed platform for loose loads. The fourth type is a tractor towing unit.

Each type of these gasoline powered trucks employs an identical model power unit as an integral part of the truck. The unit employs no transmission, clutch, electric batteries or radiator. Gasoline engines are Briggs-Stratton single cylinder, rated at 2 hp, and equipped with oil bath air cleaner and crank starter. Load capacity is 3000 lb, the tractor towing model having a drawbar pull of 260 lb. Maximum speed of all models is 3 mph.

Standard platforms are 24 in. by 48 in. Outside dimensions of pallet forks are 27 in. by 48 in., with variations available. Platform heights on the hydraulic lift models are 6, 7, 9, and 11

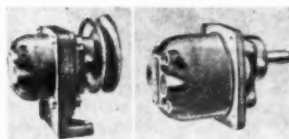
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in. Lift on the pallet carrier is 3 3/4 in. Solid synthetic-rubber tired wheels are acid resisting; military tread being available for the drive wheel. The heaviest vehicle weighs 1000 lb.

### MH-6—Oil Hydraulic Gear Pump

A new four-bolt 100 series oil hydraulic gear pump is to be shown at the



Hydreco Model PA-15 foot mounted gear pump

Hydreco Model 1005 A1A1 flange mounted gear pump

Materials Handling Show by the Hydraulic Equipment Co., Cleveland, Ohio, designed for industrial and farm tractors and for hydraulic installations on trucks to control and operate dump bodies, snow plows, and similar accessories.

Operating on pressures up to 1000 psi the pump is available in two capacities—2.25 GPM at 3000 rpm and 4.5 GPM at 3000 rpm. In either capacity it is available as a flange mounted pump or a foot mounted pump with or without pulley. A simple bolted-on bracket converts the basic flange mounted unit into the foot mounted model. The pump is available for either clock- or counter-

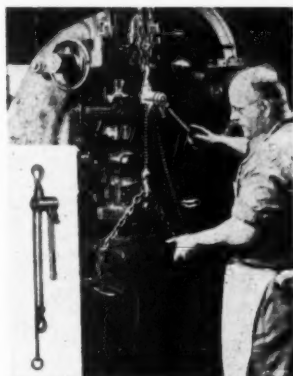
clockwise rotation. The two capacities offered are based on variance in gear width.

### MH-7—Hoist Jack; Midget Puller

A hoist-jack and a "mighty midget" puller are two new products to be observed in the booth of the Coffing Hoist Co., Danville, Ill., at the forthcoming Materials Handling Exposition in Phila.

A three-in-one tool—a hoist, a jack or a load binder—the hoist-jack is of the ratchet-and-pawl construction with a safety-load handle that bends at maximum overload before the chain will break or the hooks will straighten out. Furnished in two capacities, model HJ-1 with single stand handles 2000 lb, and model HJ-2 with double stand and double chain handles 4000 lb. Both models are factory tested at 100 per cent overload.

The "mighty midget" puller weighing 6 1/2 lb lifts or pulls a 500 lb load. A two-way handle serves as either a lever or high speed crank. The handle will yield before any part will break. For pulling tension on wires, holding plates for



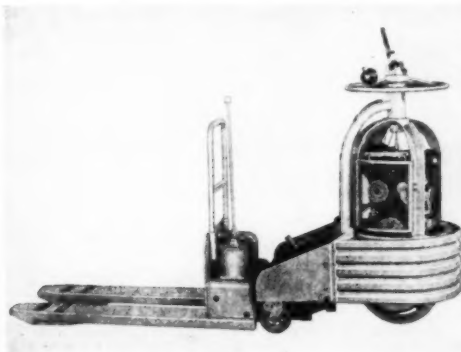
Coffing "Mighty Midget" puller

welding, lifting cylinder blocks, tightening belts, setting tool jigs and dies in place . . . the puller is factory tested at 50 per cent overload.

### MH-8—Elevating Sheet-Feeding Table

Supplementing a growing line of hydraulic elevating sheet feeding tables, LYON-Raymond Corp., Greene, N. Y., has designed and will display at the Exposition a 10,000 lb capacity unit with a 16 in. range of elevation.

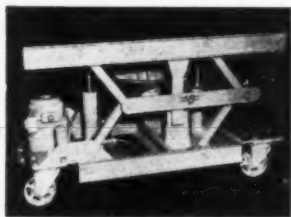
The top of this new model 66 table is 36 in. wide by 66 in. long. Side extensions can be provided which increase width to 48 in. and end extensions are available which extend length to 96 in.



Schwitzer - Cummins 3000 lb gas powered materials handling truck, the Load Dispatcher.

The new table has a lowered height of 26 in. and an elevated height of 42 in. so that the top of the pile can always be maintained at press bed height until the last sheet is handled.

The table is portable and can be loaded in a storage area and maneuvered into place by an industrial power



Sheet feeding table, model 66, offered by the Lyon Raymond Co.

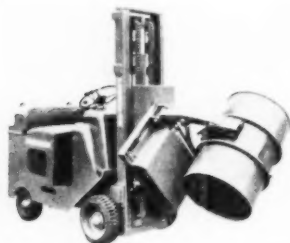
truck for which a towing eye is provided. Two 8 in. swivel casters with Timken bearings provide easy steering. The two rear wheels are 10 in. in dia and are equipped with ball bearings.

Standard equipment includes a two speed foot pump with 5 ft of hydraulic hose for placing in position convenient to the operator during sheet feeding operations. A floor lock is also provided. A  $\frac{3}{4}$  hp motor driven pump with foot operated switch is optional.

### MH-9—Bale and Barrel Grip-Upenders

Towmotor Corp., Cleveland, Ohio, will exhibit a completely new electric hand truck at the Show, the Model W. Three of the company's lift trucks will incorporate major new products, namely, the cotton bale gripper, the revolving barrel grab, and the roll grip-upender.

The revolving barrel grab is designed to lift and transport open end containers and to discharge their contents. Installed on a model LT-44 Towmotor lift truck this hydraulically controlled grab is suited for straight-sided drums or barrels from 15 in. to 30 in. dia and has a capacity of 2100 lbs at center of the grab. The hydraulic line operating the grab runs through the spindle of



Towmotor revolving barrel grab jaws gripping steel drum, and carriage revolved 45 deg to left

## NEW PRODUCTS AT THE NATIONAL MATERIALS HANDLING SHOW PHILADELPHIA--JAN. 10-14

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the revolving carriage so that constant pressure is maintained on the load throughout the 360 deg revolution in either direction for complete load control at all times.

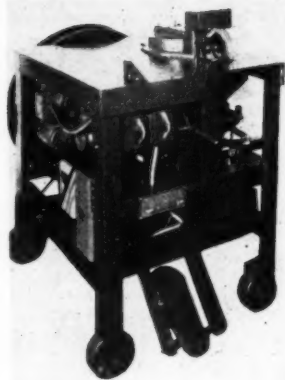
The roll grip-upender provides an industrial truck with an accessory that grips, lifts, up-ends, and stacks heavy paper rolls, etc. Installed on a model LT-40 Towmotor lift truck, the unit handles rolls 32 in. to 34 in. in dia, 46 in. long, and weighing 1500 lb each. Rolls are stacked 3-high, picked up from a vertical position and stacked in a horizontal position. The unit consists of a set of vise-like gripping arms, one stationary and the other actuated hydraulically by a lever adjacent to the operator. Arms are mounted on a Towmotor upender carriage which provides a 90 deg revolution of the load.

### MH-10—Automatic Strapping Machines

At the National Materials Handling Exposition in Philadelphia, Jan. 10-14, the Signode Steel Strapping Co., Chicago, Ill., will feature and demonstrate, for the first time, its entire new line of automatic and semi-automatic power strapping machines.

Electrically and electro-pneumatically powered, these new large-capacity power strapping machines mechanize successfully the basic operations of applying tensional steel strapping to manufactured items during mass-production fabrication or assembly, or to commodities being prepared for shipment.

The Signode type 3A power strapping machine illustrated, fully automatic, completes operations of applying steel strapping to small-dimension items. It encircles the item to be strapped with



Signode type 3A fully automatic power strapping machine

the correct amount of strap; it tensions the strap in place; it affixes and crimps the seal; and finally cuts the strap. Operations are foot-and-hand-lever controlled, leaving the operator's hands free to position and hold the item being strapped, and it is unnecessary for the operator to touch strap or seals at any time during the strapping operation.

### MH-11—Fork Trucks and Revolving Heads

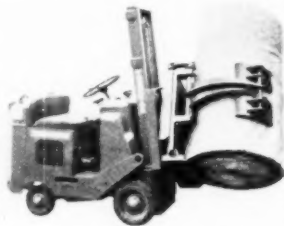
The Baker Industrial Truck Division of the Baker-Raulang Co., Cleveland, Ohio, will display and demonstrate at its first public showing the Baker type FRH-20/36 center control fork truck having a capacity of 2000 lb 36 in. long, developed particularly for factories and warehouses where floor loading capacity is restricted and aisles narrow. Weight with full load is 5,805 lb so that it may be taken from floor to floor by 3 ton elevators. It transports and tiers material on pallets or directly on the forks.

Also displayed will be the new type FBH-40/48 fork truck having a capacity of 4000 lb 48 in. long. The operator rides in a seated position and guides the truck with automotive type steer.

The unit is equipped with Baker No-Plug full contactor control with 4-speed automatic time-delay acceleration.

Likewise demonstrated at its first public showing will be the new Baker revolving head for fork trucks. This attachment may be applied to Baker fork trucks of 6000 lb capacity or less. It is mounted on the lift carriage and its revolving face plate can be fitted with forks for carrying and dumping skid boxes. Or, it can be fitted with a paper roll scoop for transporting and up-ending rolls of paper.

The revolving head consists of a stationary bed plate and a revolving face plate, the latter turning on a pair of tapered roller bearings. The driving pinion meshes with a large annular gear



Towmotor roll grip-upender, paper roll clamped in gripping jaws, and carriage partly revolved





Baker type FRH-20/36 fork truck

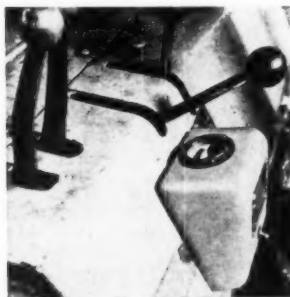


Baker revolving head for fork trucks

fastened to the face plate at its periphery, rotating power being supplied by a hydraulic motor through worm reduction. This construction is said to provide smooth control of rotation without back lash.

#### MH-12—Battery Charge Indicator

To prevent overdischarged conditions in the batteries of electric industrial trucks the Gould Storage Battery Corp., Trenton, N. J., is announcing at the Materials Handling Show a new charge indicator which gives successive momentary charge conditions of the bat-



Gould dash-mounted battery charge indicator for industrial trucks

## NEW PRODUCTS AT THE NATIONAL MATERIALS HANDLING SHOW PHILADELPHIA--JAN. 10-14

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tery, thus keeping the operator informed of the battery's state-of-charge throughout a given work shift. This dashboard mounted instrument embodies ability to report the state of discharge at any instant rather than concealing vital information until the danger zone (overdischarge) is reached, and features tamperproofness against piece-work operators looking for the last half-hour pay at the expense of the battery.

The indicator is marked-off into four sections, each of a different color. Green indicates a one-half to full charge, yellow a one-quarter to one-half charge, red a zero to one-quarter charge, and pink indicates the battery as being used in an overdischarged condition. An all-aluminum case, designed for vertical mounting, houses the instrument. The gauge is read while the truck is actually in operation.

A Wheatstone bridge type instrument, it can be used with 3, 6, 12, 15, 16, 18, and 24 cell batteries—a series of resistors and taps permitting desired adjustment. During charge a toggle switch disconnects the instrument from the battery.

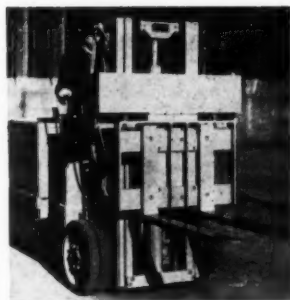
#### MH-13—Electric Tractor and Rotating Assembly

Two new machines to be exhibited by the Mercury Mfg. Co. of Chicago, Ill., at the National Materials Handling Show are a Roto-lift assembly for fork trucks, and a light duty three-wheel electric tractor.

The Roto-lift assembly, for 4000 and 6000 lb "Yak" and "Yank" fork trucks, permits dumping of pallet box loads by means of a hydraulic rotating carriage operating in 180 deg of rotation to right or left. Hydraulic pressure is supplied from the truck pump and motor system and rotation is controlled by a single convenient lever adjacent to the hoist and tilt controls.

The light duty electric tractor is a three-wheel solid rubber tired small electric haulage unit for use where floor and elevator capacities are limited and operating surfaces are reasonably smooth. Tractor chassis weighs 1450 lb. Tractor is 34 in. wide and 70 in. long exclusive of rear coupler. Light running speed is 6.5 mph with normal drawbar pull rated at 200 lb and maximum, 1000 lb. Drive axle is double reduction type.

Frame is semi-elliptic spring suspended and travel control is Mercury's



Mercury Roto-lift assembly for 4000 and 6000 lb "Yak" and "Yank" fork trucks

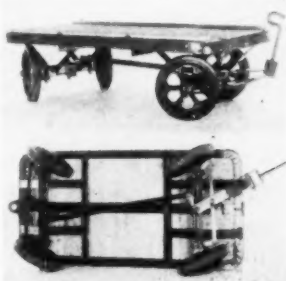


Mercury light duty three-wheel electric tractor

standard three speed mechanical contactor type.

#### MH-14—Four-Wheel-Steer Heavy-Duty Trailer

A 4-wheel-steer heavy-duty trailer to be displayed by Nutting Truck & Caster Co., Faribault, Minn., is well suited for duty in crowded quarters and in long trailer trains where it is essential that all trailers follow the track of the tractor. Conventional fifth-wheel steering and swiveling bolster has been eliminated in this construction and replaced by a "knuckle" or "spindle" arrangement. This allows the bolster to remain stationary so that the wheels, only,



Nutting stationary bolster 4-wheel-steer trailer

swing in turning. The rear wheels are activated for steering and controlled for perfect trailing by a connecting bar from the front wheel assembly.

Advantages claimed for this construction are less resistance in activating steering under capacity loads and greater load stability because a wider 4-point support is provided at maximum turning radius.

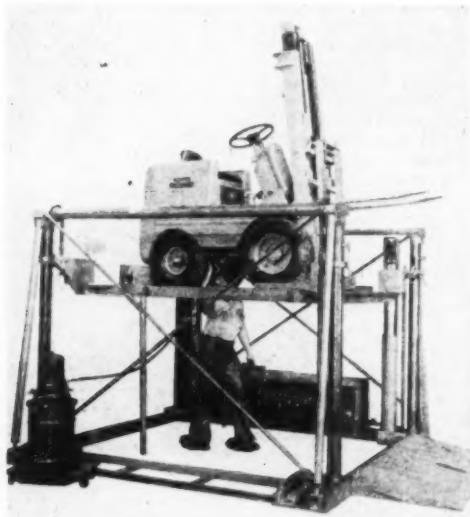
Wheels are 12 in. dia with roller bearings on C-1045 1 1/4 in. dia axles, castle washers on axle ends. Wheels are also available 16 in. and 18 in. dia. Platforms are 3 ft wide in lengths 72, 96 and 120 in. Capacity ranges from 5000 to 6000 lb. Gooseneck coupler is standard.

### MH-15—Industrial Truck Hydraulic Lifter

An electric hydraulic lifter for servicing all makes of fork lift trucks, industrial trailers and platform trucks will be shown and demonstrated for the first time at the Materials Handling Exposition in Phila., as announced by Service Caster & Truck Corp. of Albion, Mich., and Somerville, Mass.

Built in 6000 lb and 12,000 lb capacities, the maintenance lifter's open platform elevates trucks to a proper height where lubrication, inspection and servicing may be quick, safe and thorough.

Safety features of the lifter include hooks which lock into the legs at any point during the platform's rise, and safety-pipes which drop from the platform to the floor once proper height is attained. Dead-man control is a further precaution. The lifter's open platform permits complete accessibility of trucks for lubrication and maintenance work, a method of chocking truck wheels, and a special support block on which truck counterweights may rest.



Service electric hydraulic lifter for servicing all makes of fork lift trucks, industrial trailers and platform trucks

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PHILADELPHIA--JAN. 10-14

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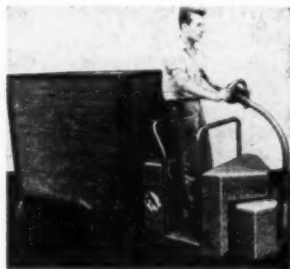
### MH-16—Balanced Pallet Grab



A pallet grab which remains balanced when unloaded for easy effort in inserting into the next pallet to be stacked will be featured by Mansaver Industries, Inc., of New Haven, Conn., at the Materials Handling Show in January. Lifting point is over the centerline of the load so that the load itself remains balanced. The grab supplements use of a pallet truck. fills in voids the truck cannot reach, and is designed to stack up to high ceilings. Mansaver grab style 1274M is pictured.

### MH-17—Riding-Type Electric Truck

A "Jacklift" electric truck of the riding type will be the latest addition to



Lewis-Shepard riding type "Jack Lift" electric truck

the materials handling line of the Lewis-Shepard Co., Watertown, Mass., to be viewed at the Materials Handling Show this Jan. 10 to 14, 1949.

The new truck provides a through corridor where the operator rides. The truck is designed to carry both operator and load under conditions of long haul and continuous use.

This riding type "Jacklift" operates the same as the standard type "Jacklift" electric truck. All controls are at handle head, convenient to operator's finger tips, featuring two speeds forward and reverse, lifting and lowering controls, horn and lock switch, and controls for the brake which applies instantly when handle triggers are released.

The truck can be operated either from position in driver's corridor, or with the operator walking at front end of the truck.

### MH-18—Four-Wheel Drive Mobile Crane

The exhibit of the Unit Crane & Shovel Corp., Milwaukee, Wis., will spot-light the new Unit 357 mobile crane with 4-wheel drive. Self-pro-

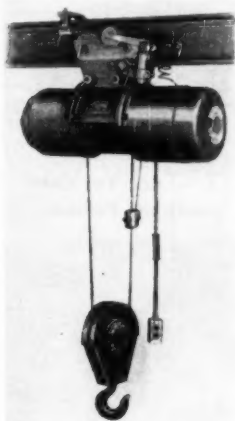


Unit 357 mobile crane

pelled, this crane is controlled and operated by one man powered by one engine. Power is distributed between two sets of driving axles. Air-actuated brakes and 4-speed transmission provide the operator with easy, instant control at all times. Handling ease is simplified by the hydraulic steering mechanism. A short turning radius increases its maneuverability in crowded yard operations and in travel on the highway.

## MH-19—Overhead Electric Hoist

New Wright Speedway electric hoists in capacities from 1000 to 20,000 lb. to be shown at the Philadelphia show by Wright Hoist Division of American Chain & Cable Co., Inc., York, Pa., incorporate all steel construction and gear train with preformed cable and swaged on cable fittings. Hoists can be furnished with lug, hook or base mounting, also Tinken trolley suspension, either cross or parallel mounted. Trolleys are furnished for either manual operation or motor drive to meet varying service requirements. Hoists built for 220 volts, 3 phase ac are



Wright Speedway electric hoist

reconnectable for use on 440 volt, 3 phase ac by merely reconnecting terminal leads.

## MH-20—Automatic Battery Charger

Three new designs of battery chargers for both motorized hand-lift trucks and the ride-on type motive-power trucks will be displayed at the third National Materials Handling Show by Electric Products Co., Cleveland, Ohio. Feature at the exhibit will be the new single-circuit battery charger for motorized hand-lift trucks.

## NEW PRODUCTS AT THE NATIONAL MATERIALS HANDLING SHOW PHILADELPHIA--JAN. 10-14

For additional information regarding any of these items, please use coupon on page 55.

Entirely automatic, this single-circuit charger permits any truck operator to charge his own vehicle "on the spot" by pushing in a charging plug and setting a pointer. The plug is polarized to prevent any possibility of error. The charger shuts down completely when the battery is fully charged by means of a synchronous motor time clock.

Battery-voltage relay automatically compensates for varying room tempera-



Electric Products Co. single circuit battery charger

tures. Motor-generator is specifically designed for battery charging and is dynamically balanced. Power supply calls for 220, 440, 550 volts; 2 or 3 phase; 60 cycle.

## MH-21—Grease Retaining Trolley Bearing

Jervis B. Webb Co., Detroit, Mich., has designed a new trolley wheel bearing with a grease seal claimed to retain lubricant under the most difficult conditions in the operation of overhead conveyors. Particular applications of the seal are said to be found in conveyors in ovens, washing machines, degreasers and other surface preparation units where heat, solvents, or strong chemicals have a destructive result on seals.

In the new seal grease is introduced through the lubrication fitting in the hub. Space under the wheel cover

provides an ample storage cavity. Lubricant easily travels into the anti-friction bearing, but is prevented from escaping by a double labyrinth.

The Red Seal swaged trolley bracket shown with this new wheel provides, in itself, an improvement over previous designs of wheel-bracket assemblies. By enlarging the wheel bore, the bracket forging is made stronger and more rigid. After assembly to the wheel, the bracket hub is swaged to form an inseparable assembly. Bearings are anti-friction type with large steel balls held in a retainer.

The outside flange of the hub provides a protected recess for the grease fitting which avoids the possibility of



Webb overhead trolley conveyor wheel with new grease retainer bearing

fittings being knocked off by handling, or broken where the trolley must pass close clearances.

## MH-22—Hydroelectric Lift Truck

A new model lift truck designed to pull live and semi-live skids by power will be demonstrated by Lift Trucks, Inc.



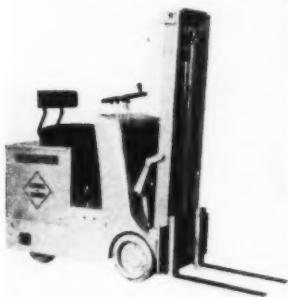
Power truck by Lift Trucks, Inc., Model Hydroelectric KTL.

Inc., Cincinnati, Ohio, at Philadelphia's Materials Handling Show. The new model, the Hydroelectric KTL, enables users, with their existing skid equipment, to cut to less than half the man hours required previously on handling jobs, it is claimed.

A wheel base of only 40 in. permits short turns in close quarters. Two speeds forward, two in reverse and dynamic brakes are all finger tip controlled.

Other features of the new truck include two front driving wheels and a differential transmission sealed in lubricant. Rated capacity of the Hydroelectric KTL is based on pulling a semi-live skid loaded with 4000 lb.

### MH-23—Fork Trucks and Pallet Retriever



New "Air Rights" series hydraulically operated fork truck Type F-15-T, of 2000 lb capacity displayed by the Elwell-Parker Electric Co., Cleveland, Ohio. Elwell-Parker is also displaying its Type F-15-T center control fork truck of 3000 lb cap. equipped with pallet retriever device

### MH-24—Batching Scales; Fork Trucks; Hoists

Products of Yale & Towne Mfg. Co., Phila. Division, to be shown for the first time at the Materials Handling Show are Yale's new remote control Cable King electronic hoist, the new Lift King gas electric fork truck, a newly developed weight printer scale attachment, and an automatic batching scale.

The remote control electronic hoist is designed for over-water transport of goods warehouse-to-ship, across expansive plant areas, over high-temperature equipment, and along rails extending out over plant yards. Its use eliminates long electric cables and permits several hoists to be electronically controlled from one central point. With it, an electronic transmitter, plugged into plant power lines, supplies energy to operate the hoist. A receiver mounted on the hoist and connected to hoist contactors, operates the hoist.

For hoist control, there are five dy-

## NEW PRODUCTS

AT THE  
NATIONAL  
MATERIALS HANDLING  
SHOW  
PHILADELPHIA—JAN. 10-14

For additional information regarding any of these items, please use coupon on page 55.

natron tubes, or, if desired, other type of audio frequency generators, each generating one audio control frequency to cause operation of one particular hoist motion.

The Yale demonstration will comprise a large Cable King hoist (capacities up to 12 tons) in conjunction with the omni-electronic control.

In the industrial truck field, Yale will introduce a radically new line of gasoline operated trucks. Early models will be available in capacities up to 6000 lb and high-lift types will tier to a height of 130 in.

In the scale field, the company will show bench, platform, counting, and crane models, operating on the new "Magnetrol" principle, and perfected within the past few months along with the new weight printer attachment.

### MH-25—Gear Motor and Rectifier Battery-Charger

General Electric Co., Schenectady, N. Y., will show at the Exposition a 25-ton diesel-electric locomotive; a new ACA gear motor; a totally enclosed, textolite fan-cooled motor; a rectifier battery-charger with a sequence charger mounted on it; a motor-generator battery charging set; control equipment for 4-circuit battery charger system; a battery truck motor; control panel, and master switch; photoelectric counter; pendant crane control; and Triclad gear motor.

In addition to the diesel locomotive, the chief features of the exhibit at the show will be the ACA gear motor and the rectifier battery-charger with the sequence charger mounted on it. The rectifier battery charger is a device which makes it possible to charge two batteries where only one could be charged before. One battery is charged for four or five hours to approximately 85 per cent of capacity, removed, and another battery put on and charged to the same limit. Then both batteries are connected to the charger at the same time and together are charged to full capacity.

### MH-26—New Model Steelstrapper

In addition to exhibiting a complete line of steel strapping and accessories at the Materials Handling Exposition, Acme Steel Company's strapping di-



Acme steelstrapper No. 3 mounted on the new E5 tool mount

vision, Chicago, Ill., will display and demonstrate the new Acme E5 mount.

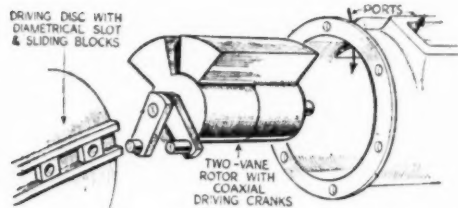
This streamlined strapping tool mount has rubber castings for easy portability, 4 leveling screws on the base for eliminating wobble on uneven floors. The mount has a 17 in. vertical movement without post adjustment, and a post adjustment of 21 in., or a total of 38 in. vertical movement. The strapping tool can be used in a 360 deg circle around the post, to facilitate cross strapping. This mount is designed for all models of Acme steelstrappers, and can be mounted in the floor without a base, or attached to a conveyor or strapping table.

### MH-27—True Vertical Stacking Pallets



Stak Pallet, to be found on exhibit at the Show is presented by The Materials Handling Division of Industrial Washing Machine Corp., New Brunswick, N. J., permits stacking of loaded pallets, one upon another with complete safety to both materials and personnel, permits transporting and storing of unevenly piled materials without risk of sliding, tilting or spilling, and prevents crushing and fusing of soft or heated materials on pallets. Four uprights which support the stacked loads, are quickly collapsible for compact storing when pallets are not in use. Of all steel capacity the pallets have a 4000 lb. (dead weight) capacity.

# Vane Type Supercharger of Unique Design



This sketch shows the simple construction of the Mangoletsi supercharger.

The device is reversible and can be used as an air motor.

Mangoletsi superchargers have not as yet been made in small sizes suitable for automobile engines, but the design has been produced for a large engine builder and considerable progress is reported.

The prototype was made by the G.M. Carburetor Co., Old Colony House, S. King St., Manchester 2.

THE Mangoletsi rotary blower, a new type vane supercharger, has recently been introduced in England, according to *The Autocar* (London). It has a plain cylindrical body at the axis of which are two contra-centric hubs, each of which is half the length of the bore. As shown in the illustration, there are two wedge shaped vanes, each of which is attached to a hub. One hub spindle is solid, and passes through the other which is tubular. On each spindle is a crank, the outer end of which engages a block sliding in a diametrical groove

of the cylinder less twice the space occupied by the rotor and vanes, or about  $1\frac{1}{2}$  times the cylinder volume.

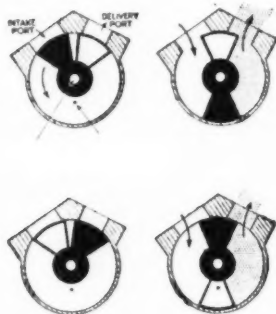
## New Two-Speed Rear Axle

VACUUM is employed to operate the shifting mechanism of a two-speed rear axle just introduced by the Leyland Co., England, for use on its truck and coach chassis. A five speed transmission provides the first reduction through a bevel pinion and ring gear in the usual way. On the low ratios, planetary gears are brought into operation by a pull and push lever, mounted on the main gear shift lever, which controls vacuum to a large diaphragm-type vacuum cylinder mounted on the axle housing. The combination gives ten speeds with rear axle ratios of 5.14 to 1 for the high gear and 7.15 to 1 for the low.

The ring gear has teeth cut internally in it which mesh with four planetary pinions which in turn mesh with long

external teeth cut on the inner end of a sliding sleeve. At the outer end of the sleeve are cut further teeth. When these teeth at the outer end of the sleeve are in mesh with a stationary clutch plate, the sleeve is held stationary, so forcing the planet wheels to revolve around it, producing low gear ratio. In high gear position of the sleeve the long internal teeth, in addition to meshing with the pinions, also mesh with a plate revolving with the ring gear. This locks the planet wheels, thus the differential case is carried around at the same speed as the ring gear, giving high gear ratio.

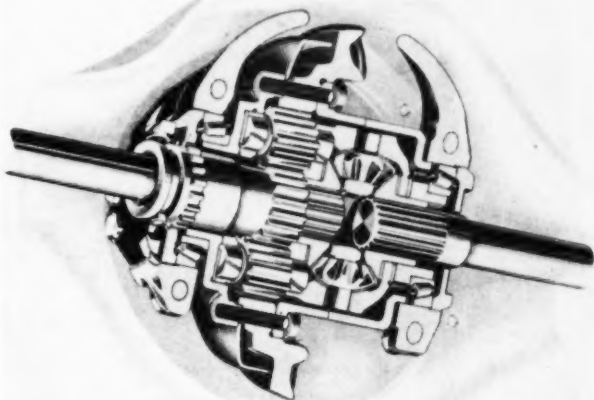
When the engine is stopped, or if the vacuum fails, the speed is automatically returned to low ratio. A cutaway view is shown below.



Cross section sketch of the supercharger showing cycle of operation.

in the face of a driven disk eccentric to the rotor assembly. Rotation of the disk causes the cranks to rotate so that the vanes revolve in the cylinder. In addition, the movement of the crankpin blocks within the groove superimposes an alternating acceleration and deceleration on the rotors so that the vanes approach each other and separate twice during each revolution.

Intake and discharge ports are arranged so that air is taken into the space between the vanes as they separate and is compressed and discharged as they approach each other. Since the cylinder is swept twice per revolution, the air discharged is twice the volume



Cut-away view of two-speed rear axle used on trucks and coaches made by the Leyland Co.



## B-1—Production Milling Machine

George Gorton Machine Co. has entered the production milling field with a completely new No. 2 horizontal (plain type) production milling machine claimed to approach the rigidity and stability of bed-type machines. Featuring fullwidth knee this model 2-28B delivers 10 horsepower to the spindle through a simplified gear train having only two gears in driving contact at any speed. An entirely separate motor is used for longitudinal, cross and vertical feeds.

A square lock bearing is provided between column and knee and between knee and saddle. In addition, a narrow center guide is provided on both column and knee to furnish a positive guard against tipping of the knee and "cocking" of the saddle. Because the saddle has a bearing spread on the knee almost equal to the table travel, sag is prevented when the table is fully run out. Design of the saddle includes totally enclosed coolant channel.

Spindle motor is totally enclosed in the column base and mounted parallel to the spindle.

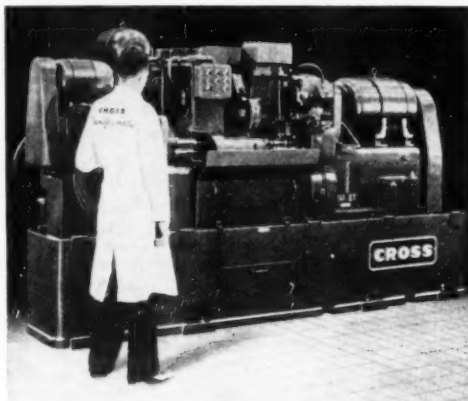
All controls are full directional, each adjacent to its corresponding handwheel or crank. Live rapid traverse is provided. Spindle is reversible with positive switch. The lubricating system is completely automatic.

A motorized centrifugal coolant pump is located at the right rear of the column base, directly coupled with coolant reservoir in the foot of the column. A self-contained electrical control cabinet is mounted on the right hand side of the column. Spindle is stopped instantly through electrical braking action of a



For additional information regarding any of these items, please use coupon on page 55.

Cross special machine for oil pump body finishing



zero speed switch. All electrical controls are interlocked so that if the spindle motor stops for any reason, all machine elements stop.

## B-2—Oil Pump Body Finishing Machine

On a new special oil pump body finishing machine designed by the Cross Co., Detroit, Mich., operations performed at the rate of 63 pieces per hour include milling both ends, drilling two mounting holes on the left end, drilling and tapping four cover holes on the right end, drilling and reaming two bearing holes, roughing and semi-finishing two gear pockets, and forming a pressure relief cavity.

The machine has a ten station, power operated index trunnion, with an independent station for loading and unloading while the machine is operating. It

cuts nine pieces at a time progressively. Features include fluid drive index with over-load protection; automatic relief for milling cutters during the return stroke; hardened and ground steelways; hydraulic feed for drilling, reaming, and milling; and a lead screw feed for tapping.

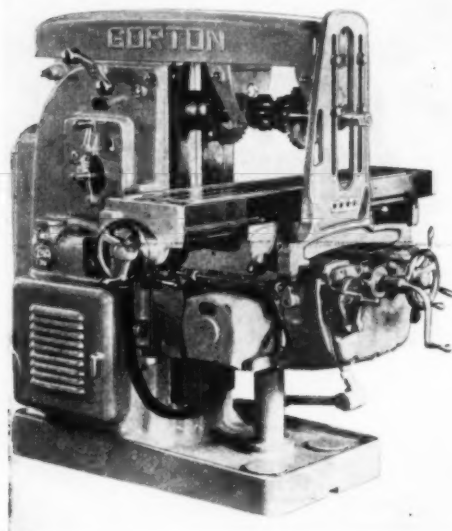
Flexibility for part design changes are provided through use of standard Cross index assemblies and way-type feed units.

## B-3—Rough Boring Special Machine

A new machine which increases production 4 to 1 in rough boring railroad car wheels and similar large forgings and castings has been designed and built by Snyder Tool & Engineering Co., Detroit, Mich.

Developed especially for use in foundries and steel mills this machine has the massiveness and rigidity required to assure maintenance of exact tolerances over an estimated machine life-time of 20 years. While the unit shown is applied to rough boring car wheels, a similar machine is available for finish boring on any type of large casting or steel forging.

The machine has two stations and is equipped with a hydraulically operated



Gorton plain type No. 2 horizontal production milling machine 2-28B

shuttle slide which moves the workpiece from the loading station to the work station, then shuttles it beyond, to the unloading and reloading position. The fixture travels on automatically lubricated hardened and ground V-type ways, which allow for normal wear without developing side-play. Clamping is hydraulic.

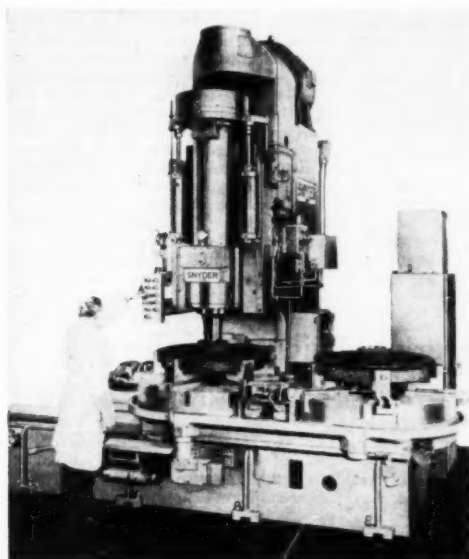
A 75 hp motor is coupled directly to the geared and splined drive mechanism. Tungsten carbide tools are used in this particular application and remove 1 in. of stock from a 5½ in. dia. pierced hole 7½ in. long in a steel car wheel. Cutting time is 55 seconds per wheel. Any type tools may be used as required by the composition of the

## NEW Production and Plant EQUIPMENT

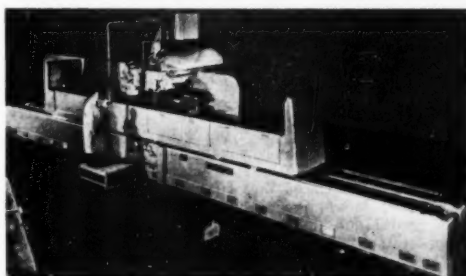
*For additional information regarding any of these items, please use coupon on page 55*

In spite of massiveness of the machine just two levers control the entire hydraulic movement of the table and wheel head units. An anti-friction elevating nut permits accurate feeding of the wheel head of .0001 in. Need for feeling the feed is eliminated. Controls are hydraulically balanced for finger tip control. Table and wheel head feeds are hydraulically operated. Table speeds are variable between 10 to 100 ft per minute with single lever control. Fast operation with heavy table loads is accomplished without shock or dwell by means of a valve having simple micrometer adjustments.

An automatic feed to the wheel head acting at each reversal of the table is



*Snyder rough boring machine for large forgings and castings*



*Thompson heavy duty type CX 30 in. by 48 in. by 196 in. hydraulic way grinder*

adjustable within limits. Hydraulic rapid traverse is 240 in. per minute and hydraulic wheel truing 6 in. per minute. The wheel head unit is powered with a 30 hp motor mounted directly on the wheel head, combining maximum delivery of power to the grinding wheel with permanent freedom from vibration.

The spindle is alloy steel, Magna Fluxed, ground and lapped, and operating silver lined bearings have an absolute minimum clearance. Automatic lubrication is provided by pressure pump interlocked with spindle motor.

workpiece. Tool speeds range from 80 to 240 rpm., and feed speeds are infinite. Stroke is 14 in. Coolant system with pump can be supplied if required. Lubrication is automatic. Operation is fully automatic.

Column and base are welded steel and cast iron construction. Floor space required is 158 in. by 97 in. Compared to old equipment which bored 6 to 8 wheels an hour, this machine bores 40 steel wheels or 70 cast iron wheels an hour. It is highly adaptable to boring operations on many shapes and sizes.

model illustrated has a giant 46 ft bed length and was manufactured for a well known lathe manufacturer to grind the ways of larger machines.

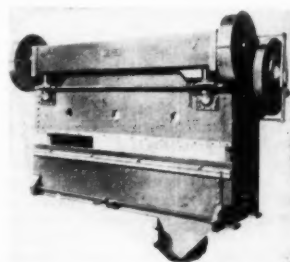
The machine is equipped with auxiliary vertical spindle for grinding safety gib, clamp surfaces and rack seats on the machine bed. Lathe bed ways are ground with the horizontal spindle having a grinding wheel trued to the proper angle for Vees and Flats. The working capacity of the horizontal spindle is 240 in. The massive column alone weighs over ten tons, and heavy rib construction throughout the base provides a rigid foundation free from distortions, for permanent accuracy under continuous heavy duty grinding operations. The high powered wheel head and slide unit is mounted on a single column with rectangular ways and with a favorable ratio of length to width of bearing span. Flame hardened wheel head slide ways are precision ground and protected by neoprene bellows way covers.

### B-4—Hydraulic Way Grinding Machine

A massive way grinding machine, known as the Thompson heavy duty type CX 30 in. by 48 in. by 196 in. hydraulic way grinder, has been added to the line of big heavy duty surface grinders manufactured by The Thompson Grinder Co., Springfield, Ohio. The

### B-5—New Power Press Brake

Columbia Machinery and Engineering Corp., Hamilton, Ohio, has ex-  
(Turn to page 62, please)



*Columbia power press brake*

# Aircraft Workers to be in Big Demand in Spring

By Karl Rannells Washington Bureau, AUTOMOTIVE INDUSTRIES

INDICATIONS are that the overall employment of aircraft workers apparently will continue upward well past the first half of 1949 with the biggest demand showing up about early spring. It would appear, too, that in some areas there is going to be more jobs in highly skilled work than there will be workers to fill them.

These conclusions are drawn from a report on a recent survey conducted by the United States Employment Service. The findings were taken from reports by 54 aircraft manufacturing firms which comprise nearly all the plants engaged primarily in plane manufacturing.

Aircraft employment had reached a low point of 193,000 last June. But as a result of defense planning and new orders coming in, something like 204,000 workers were on the payrolls by the end of August. On the basis of plans reported, it is indicated that such employment would be increased more than 14,000 by the end of December with a grand total of 225,000 by the first of March.

The recall of aircraft workers is expected to follow a tough road in some respects with highly skilled workers harder and harder to find as time goes on—providing high national employment continues, as most think it will. Already some shortages have shown up in specialized jobs such as engine installation, etc.

The immediate and most pressing need seems to be for the building up of a nucleus of experienced and skilled workmen in engineering, retooling, and testing, who also would be capable of supervising and training others in these types of work as well as in production lines.

Making recruitment of workers more difficult is the fact that the Air Force and the Navy have been employing aircraft workers, particularly aircraft mechanics. These workers have been putting their skill to use in repairing and conditioning of standby planes—but for working purposes the effect is Government competition in the same labor market.

Plans of the Air Force alone call for adding between 5000 and 10,000 aircraft workers to its employes between last August and next June. Most of this expansion will be concentrated within 10 major locations—Ogden, Rome, Mobile, San Antonio, Middletown (Pa.), Macdon, San Bernardino, Sacramento, Oklahoma City and Dayton.

Most of the industry, about 85 per cent, is concentrated largely in eight states. More than a third is in California and the other seven states are Connecticut, Texas, Maryland, New Jersey, Washington, New York and Kansas. Single areas important to aircraft production are Indianapolis, St. Louis,

Dayton, Columbus, Akron and Philadelphia.

In most areas to date, little trouble is encountered in obtaining sufficient welders, form block makers, magnetic inspectors, upholsterers, machine operators and power brake operators. Nor does there seem to be a serious shortage of most types of unskilled workmen.

On the other hand, shortages of male labor is being felt in varied skilled occupations in several of the foregoing areas and recruiting is becoming increasingly difficult. These include precision tool grinders, lathe operators, woodworkers, milling machine operators and engineering lines.

There appears to be two major sources on which the aircraft producers will have to rely for its staffing. One is former employes who have drifted into other industries and the other is the feminine group.

Probably the chief source will be workers in other industries since, for one reason or another, aircraft jobs appear to have an attraction over others. At one time during the war, about two million were so employed. As to the

second labor source, during the war employment of females in aircraft production rose as high as 40 per cent—about 800,000. Today, the ratio is about 13 per cent or 26,000 of the total.

Not even the USES will venture an estimate as to how many of these experienced female craftsmen could be recalled. Many have married and could not and would not return except as a war emergency; those who remained in the labor market have taken white collar positions, jobs which many will not be tempted to leave.

Most plants apparently are not relying too strongly on the latter source. In some areas where labor scarcity is not yet too serious, some plants are hiring only male workers. Still others are planning to use women only when the male supply on the seniority and call-back lists is exhausted. Quite a few are drawing on recent high school graduation lists for youngsters for whom they plan extensive training.

From an overall viewpoint, the USES survey indicates that plant production as a whole has not yet been handicapped (Turn to page 84, please)

## Measuring Thickness of Copper-Nickel Coatings

A CONVENIENT, nondestructive magnetic method for determining the thickness of composite copper-nickel coatings electrodeposited on steel has been developed at the National Bureau of Standards. The method involves the measurement of the attractive force between the plated specimen and two permanent magnets of different strengths. The values thus obtained are used, in conjunction with a set of previously determined calibration curves for each magnet, to obtain the total thickness of the coating and the relative thicknesses of the copper and nickel layers.

This method utilizes the principle of the Magne-gage, an instrument originally designed at the Bureau to measure the thickness of single electrodeposited coatings on the basis of the attraction between a small permanent magnet and the plated sample. The Magne-gage is essentially a spring balance, on the arm of which a magnet is suspended in contact with the coated surface. A helical spring is so attached that, when wound by means of a knob, it exerts a force tending to detach the magnet from the surface. If, as is ordinarily the case, the coating is less magnetic than the object plated, the required force, as indicated on a dial adjacent to the knob, will be greater for thinner coatings.

For measurement of composite coat-

ings, the Magne-gage is modified by the use of two magnets of different strengths. A set of calibration curves for each magnet—total thickness versus dial readings—are plotted on transparent material for coatings of successively varying known proportions of copper and nickel. After readings are taken with each magnet on the composite coating under study, one set of calibration curves is superposed on the other in such a way that the values of the two separate dial readings on the horizontal scale for each magnet are brought into coincidence. A straight line is drawn joining points of intersection of curves of the same percentage composition. If a second line is then drawn, perpendicular to the horizontal scales of the graphs, through the point representing the dial readings, it will intersect the first line in a point corresponding to the thickness of the total coating. The relative thicknesses of the copper and nickel layers are also obtained by graphical interpolation along the line joining the intersection points of the curves of equal composition.

In this way, total thicknesses of composite coatings ranging from 0.0005 to 0.003 in. can be determined within about 10 per cent. The thickness of each layer of similar coating can be measured accurately to 15 per cent.

## PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of **AUTOMOTIVE INDUSTRIES**. In making requests please be sure to give the **NUMBER** of the item concerning the publication desired, your name and address, company connection and title.

### A-1 Drillers and Tappers

National Automatic Tool Co., Inc.—The company's line of new Model C Holesteel Type B Adjustable Multi-Spindle General Purpose Drillers and Tappers is announced in a 20-page booklet. It is indexed for complete, quick reference and contains illustrations and specifications. Also included are actual case histories of production experience with these machines, and complete spindle selection data.

### A-2 Gages

Pratt & Whitney Div., Niles-Bement-Pond Co.—A new circular, No. 512, covering "Magnetic" Gages for continuous gaging and "Magnetic" Schuster Gages, has been issued. Several views of the Model 10-A are shown, together with illustrations of the temperature compensator and control meter for this model. Text includes descriptions of the various features and applications.

### A-3 Centri-Die Castings

Lebanon Steel Foundry—A new 12-page illustrated booklet intended to serve as a useful data reference source

for executives, engineers and designers, gives detailed information on the Centri-Die process of centrifugal casting in permanent molds. Particular emphasis is directed to significant possibilities for Centri-Die production of circular shapes, and others in which there is constant need for cylindrically cast parts of low structural alloy heat-resistant and corrosion-resistant metals.

### A-4 Forgings

Steel Improvement & Forge Co.—A new booklet describes in detail the various types and characteristics of forgings and discusses important considerations in designing for forgings, etc. Tables present complete information on the characteristics and applications of commercial forging metals, including carbon and alloy steels, corrosion resisting steels and high temperature alloys. Forging production processes, heat treating procedure, machining of forgings and inspection procedure practiced by the company is pictorially described. Tables contain tensile properties and general uses of steels. Illustrations show typical grain flows of forgings, steps in forging process, etc.

### A-5 Centerless Grinding

Simonds Abrasive Co.—The "Pay-Off" wheel that Gives Full Benefits from Centerless Grinding, is the title of a new 8-page booklet being offered by the company. It quotes field reports indicating the results in finishing and stock removal achieved in all types of centerless grinding. Suggestions for operating efficiency and wheel recommendations for grinding on all types of metal are included.

### A-6 Alloy Steel Chain

S. G. Taylor Chain Co.—A new booklet on the "Inspection, Care and Use of Taylor Made Alloy Steel Chain" is available. The contents include: A check list of things to look for when inspecting chain in your plant; factors that enter into and govern the proper use of chain; a plan for assuring your chain the necessary care; a table giving the maximum wear limits for each diameter of chain; the safe-working load limits of each size of chain and the correct methods of repairing Taylor Made Alloy Steel Chain.

### A-7 Metal Preservation

American Chemical Paint Co.—Seven new folders on metal preservation and paint durability on metal have been made available. They include: Alodine, Deoxidine, Duridine, Cold Spray Granodizing, Lithoform; Rodine and Thermoil-Granodine. Each folder describes a specific metal-treating chemical briefly and thoroughly. Illustrations

(Turn to page 60, please)

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# PERSONALS

*Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.*

**Chrysler Corp., Export Div.**—George H. Strock has been appointed to the staff of C. B. Thomas, President of the Division.

**Chrysler Corp.**—The appointment of Walter M. Spencer as Asst. Director of Service, Dodge Div., has been announced.

**Ford Motor Co.**—Ralph W. Lemmer has been made head of the Pittsburgh Parts Depot. James P. O'Bryan is now head of the Dearborn Parts Depot.

**Curtiss-Wright Corp.**—William C. Jordan, Vice-President and General Manager of Wright Aeronautical Corp., was elected President and Director of both Curtiss-Wright Corp., and its subsidiary, Wright Aeronautical Corp. Guy W. Vaughan was elected Chairman of the Board of Curtiss-Wright Corp. Paul Shields becomes Chairman of the Executive Committee.

**Fairchild Engine and Airplane Corp.**—J. Carlton Ward, Jr., Board Chairman, was elected to head the Stratos Corporation (wholly-owned subsidiary) board. Lawrence B. Richardson, Fairchild President, was elected president of Stratos and Myron B. Gordon, Fairchild Vice-President in charge of Operations, was elected Stratos Vice-President. Eugene Newbold, Jr., was appointed General Manager.

**Pontiac Motor Div.**—Appointment of B. A. Holbel as Central Office Manager has been announced.

**Nash-Kelvinator Corp., Nash Motors Div.**—Arthur J. Bruen has been appointed an Asst. Treasurer.

**United States Rubber Co.**—Herbert E. Smith becomes Chairman of the Board and Chief Executive Officer. Harry E. Humphreys, Jr., will become President and Chairman of the Executive Committee. F. B. Davis, Jr., Vice-President and Chairman of the Finance Committee, has announced his retirement. Arthur Surkamp was elected Vice-President and Chairman of the Finance Committee to fill the vacancy created by Mr. Humphreys' promotion. Herbert M. Kelton, General Auditor, was elected Treasurer.

**Firestone Tire and Rubber Co.**—Samuel W. String, Jr., is the newly appointed Comptroller of the Firestone Industrial Products Co.

**Reynolds Metals Co.**—A. W. Pingel has been appointed Industry Manager of the newly formed Industrial Parts Co.

**Motorola, Inc.**—Walter H. Stellner has been named Vice-President of Merchandising and Elmer H. Wavering Vice-President of Products Design.

**Nox-Rust Chemical Corp.**—The appointment of Ray H. Stuff as Sales Manager, has been announced.

**United Specialties Co.**—The following officers were elected at the annual meeting of the Board of Directors: John T. Beatty, President; A. Vander Meulen, Vice-President and Treasurer; H. G. Chandler, Vice-President, charge of Sales; J. C. Pickel, Vice-President; B. H. Fretz, Secretary and Asst. Treasurer, and G. M. King, Asst. Secretary.

**A. Schrader's Son Div., Scovill Mfg. Co., Inc.**—Selden T. Williams, Vice-President of Scovill Mfg. Co., was appointed General Manager.

**Carboloy Co., Inc.**—Harry Crump has been named assistant to the Sales Manager.

**Dana Corp., Spicer Mfg. Div.**—Appointment of R. R. Burkhalter as Chief Engineer has been announced. Mr. Burkhalter succeeds J. W. B. Pearce, retired.

**Harry Ferguson, Inc.**—The appointment of Morris E. Fonda as Publicity Manager and the appointment of Frederic A. Lyman as Product Education Manager, has been announced.

**The Carborundum Co.**—Paul J. Speyer has been made Sales Promotion Manager.

**Devco and Reynolds Co., Inc.**—The resignation of William H. Mathews, Vice-President and Director of the Company, has been announced.

**Harley Machine Co., Inc.**—Alfred H. Harley has become Vice-President.

**Topflight Tool Co., Inc.**—William H. Wagner has been appointed Aircraft Tool Production Engineer.

## Necrology

**John R. Black**, 66, retired service sales manager, Monroe Auto Equipment Co., died recently in Monroe, Mich.

**Harry C. "Cotton" Henning**, 52, the Indianapolis Motor Speedway's master mechanic, died in Indianapolis, Ind. on Dec. 9.

**Raymond Wilson Cook**, 58, executive vice president, Associated Spring Corp., Bristol, Conn., died in Hartford, Conn. on Dec. 4.

**Clifford V. Williams**, 51, general sales manager, GM's Delco Products Div. died Dec. 16 in Dayton, O.

**J. R. Ackerman**, 58, merchandising manager, Kaiser-Frazer Corp., died on Dec. 18 in an automobile accident near Birmingham, Mich.

**National Security Resources Board, Automotive Div.**—Samuel W. Rolph, Executive Vice-President of the Electric Storage Battery Co. and Ernest C. Kanzler, Chairman of the Universal C.I.T. Corp., have been appointed consultants to the automotive division.

**Fitzjohn Coach Co.**—William Sneed has been made Service Manager and K. R. Christensen has been made Service Parts Manager.

**The Mengel Co., Plywood Div.**—Albert L. Entwistle has been elected a director of the company and Vice-President in charge of the Plywood Div.

## Higher Prices on Chevrolet Light and Medium Duty Trucks

**I**NCREASES in prices ranging from \$50 to \$90 per unit on the light and medium duty trucks have been announced by Chevrolet in conjunction with the introduction of 1949 commercial cars and trucks which went into production Dec. 13. Those increases, however, do not apply to two-ton models. The 1949 models incorporate a number of changes and refinements noted below, although generally speaking the basic styling and design features of the 1948

Advance-Design line have been continued.

Cab mounting has been changed from three-point to a four-point suspension with twin-shackles at the rear corners. The bolts are mounted in rubber bushings while the rubber bumpers formerly used at the corners have been eliminated. Loading heights are reduced by 3½ in. on the platform, stake and high rack models in the 5000 and 6000 Series.

(Turn to page 60, please)



# President's Certificate of Merit Awarded to Wartime Specialists

**I**N recognition of their wartime contribution to aviation, The President's Certificate of Merit was awarded in December by the Air Force to a number of civilians in the aircraft, automobile, engine and allied industries. Those honored, their company affiliations during World War II, and the services for which they have been awarded the certificate, are listed as follows:

J. L. Atwood, North American Aviation, for airplane design and administrative organization.

L. D. Bell, Bell Aircraft Corp., for design, development and manufacture of military airplanes.

LeMotte T. Cohn, Northrup Aircraft, for design, development and production of night fighter aircraft.

Donald W. Douglas, Douglas Aircraft Co., for the manufacture and mass production of bombardment and cargo aircraft.

C. L. Egtvedt, Boeing Airplane Co., for original development of B-17.

R. E. Gross, Lockheed Aircraft Co., for the manufacture and mass production of military aircraft.

Fred W. Herman, Douglas Aircraft Co., for engineering and production of aircraft.

Hall Hibbard, Lockheed, for conception, design and perfection of many wartime combat airplanes, especially the P-38 and P-80 series.

George A. Huggins, Douglas, for manufacture and production of military aircraft.

William S. Jack, Aero Industries Corp., for manufacture and mass production of intricate aeronautical equipment.

James Howard Kindelberger, North American, for manufacture and mass production of military aircraft.

Isaac Machlin Laddon, Consolidated Vultee Aircraft Corp., for design and construction of wartime aircraft, especially the B-24.

J. K. Northrop, Northrop Aircraft, for aircraft, development and the perfection of the flying wing airplane.

Arthur E. Raymond, Douglas, for engineering, design, development and perfection of military aircraft such as the A-20, C-54 and A-26.

T. Claude Ryan, Ryan Aeronautical Co., for services in pioneering in 1939 the civilian flying training program of the Army Air Forces.

Harry Woodhead, Consolidated Vultee, for the manufacture and mass production of large and small military aircraft.

E. C. Wells, Boeing, for engineering of modification on the B-29.

Phillip G. Johnson, Boeing (posthumous award), for the production of bomber aircraft.

W. E. Beall, Boeing, for engineering and modification work on B-17 and B-29 bombers.

Werner J. Blanchard, Aeroproducts Division, General Motors (posthumous award), for the development of hydraulically controlled aircraft propellers.

Richard S. Boutelle, Fairchild Engine and Airplane Corp., for production of military aircraft.

Ernest R. Breech, Bendix Aviation Corp., for production of equipment for planes, ships and transport vehicles.

Mead L. Bricker, Willow Run Bomber Plant, for production of bomber aircraft.

James V. Carmichael, Georgia Division, Bell Aircraft Corp., for production of bomber aircraft.

George T. Christopher, Aircraft Engineering Division, Packard, for production of aircraft engines.

Robert L. Earle, Curtiss-Wright Corp., for the production of steel aircraft propellers.

William K. Ebel, Glenn L. Martin Co., for the engineering and development of military aircraft.

Malcolm P. Ferguson, Bendix Aviation Corp., for engineering and manufacture of aircraft products.

Walter O. Briggs, Briggs Manufacturing Co., for production of aircraft and aircraft parts.

Edward F. Fisher, Fisher Body Division, General Motors, for production of fighter and bomber aircraft.

William P. Gwinn, Pratt and Whitney Division, United Aircraft, for engineering and installing engines in prototype planes.

Joseph T. Hartson, Glenn L. Martin Co., for the production of military planes.

Ronald M. Hazen, Allison Division, GMC, for aircraft engine development.

W. C. Heath, A. O. Smith Corp., for the manufacture of steel propeller blades for aircraft.

S. D. Heron, Ethyl Gasoline Corp., for the development of aircraft engine fuels and lubricants.

L. S. Hobbs, Pratt & Whitney Aircraft Division, United Aircraft, for engineering, research, design and development of engines for aircraft.

H. Mansfield Horner, Pratt & Whitney Aircraft Division, United Aircraft, for production of trainers and heavy bombardment aircraft.

Ormond E. Hunt, General Motors, for mass production of high precision aircraft equipment.

Alexander Kartveli, Republic Aviation Corp., for development and design of amphibian and pursuit planes.

William D. Kennedy, Wright Aeronautical Corp., for construction of aircraft engines.

Chester H. Lang, General Electric, for assistance in development of B-29 remote control turret system.

Raymond P. Lansing, Eclipse-Pioneer Division, Bendix, for production of aircraft instruments and accessories.

Paul W. Litchfield, Goodyear Aircraft Corp., for the manufacture of aircraft parts and sub-assemblies.

Frank L. Magee, Production Division, Aluminum Co. of America, for services in meeting aircraft industry aluminum requirements.

Earle Martin, Glenn L. Martin Co., for mass production of airplanes.

Glenn L. Martin, Glenn L. Martin Co., for mass production of airplanes.

R. C. Muir, Apparatus Department, General Electric, for developing first American-made jet engine.

E. B. Newill, Allison Division, General Motors, for production of aircraft turbo-jet engines.

J. Earl Schaefer, Wichita Division, Boeing, for production of primary training aircraft.

I. I. Sikorsky, Sikorsky Aircraft Division, United Aircraft, for design of first successful helicopter.

Frederick C. Crawford, Thompson Products, for production of aircraft valves and engine parts.

Harlow H. Curtice, Buick Division, GMC, for production of Pratt & Whitney aircraft engines.

Ralph S. Damon, Republic Aviation Corp., for the development and production of combat aircraft.

Hugh Dean, Chevrolet Motor Division, GMC, for the production of Pratt & Whitney aircraft engines.

Guy W. Vaughan, Wright, for contributing to advancement of aircraft industry.

J. G. Vincent, Packard Motor Car Co., for development of aircraft engines.

J. Carlton Ward, Jr., Fairchild Engine and Airplane Corp., for production of primary trainers and cargo planes.

Albert J. Weatherhead, Jr., Weatherhead Co., for development and production of aircraft accessories and equipment.

Alfred M. Wilson, Aeronautical Division, Minneapolis-Honeywell Regulator Co., for production of automatic pilot and turbosupercharger regulators.

Burdette S. Wright, Airplane Division, Curtiss-Wright, for mass production of aircraft.

Raymond W. Young, Wright Aeronautical Corp., for production of aircraft engines.

C. C. Pearson, Curtiss-Wright, for mass production of military aircraft.

## Business in Brief

Written by the Guaranty Trust Co.,  
New York, Exclusively for AUTO-  
MOTIVE INDUSTRIES.

General business activity during the first week in December registered a moderate advance. Department store sales, electric power production, railway freight loadings and bituminous coal output were higher than in the preceding week, but crude oil production and construction were reduced. The New York Times index of activity for the week ended Dec. 4 stands at 155.8, as compared with 151.5 in the preceding week and 155.4 a year ago.

Sales of department stores during the week ended Dec. 4, as reported by the Federal Reserve Board, equaled 485 per cent of the 1935-39 average, as compared with 347 in the week before. Sales were four per cent below the corresponding distribution a year earlier, marking the fifth consecutive week of sales below the 1947 level. The total in 1948 so far reported is five per cent greater than the comparable sum in 1947.

Electric power production increased more than seasonally in the week ended Dec. 4. The output was 8.2 per cent above the corresponding amount in 1947, as compared with a similar advance of 7.3 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 804,183 cars, 11.2 per cent more than the figure for the week before, but 8.5 per cent below the corresponding number recorded in 1947. Loadings of miscellaneous freight increased contrasensually.

Crude oil production in the week ended Dec. 4 averaged 5,615,150 bbl daily, 1909 bbl less than in the preceding week, but 350,361 bbl above the comparable output in 1947.

Production of bituminous coal and lignite during the week ended Dec. 4 is estimated at 11,320,000 net tons, 12 per cent more than the output in the week before. The total production in 1948 so far reported is six per cent below the corresponding quantity in 1947.

Civil engineering construction volume reported for the week ended Dec. 9, according to *Engineering News-Record*, was \$83,692,000, 77 per cent less than the preceding weekly figure and 12 per cent below the comparable sum in 1947. The total recorded for 39 weeks of this year was 25 per cent more than the corresponding amount in 1947. Private construction was 11 per cent above that a year ago, and public construction increased by 43 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended Dec. 7, at 163.7 per cent of the 1929 average, was 0.8 per cent lower than in the preceding week but 0.6 per cent more than the corresponding figure in 1947. Prices of farm products and foods decreased approximately two per cent.

Member bank reserve balances declined \$157 million during the week ended Dec. 8. Underlying changes thus reflected include a decrease of \$56 million in Reserve bank credit, accompanied by increases of \$93 million in money in circulation and \$66 million in non-member deposits and other Federal Reserve accounts.

Total loans and investments of reporting member banks decreased \$132 million during the week ended Dec. 1. A decrease of \$18 million in commercial, industrial, and agricultural loans was recorded. The sum of these business loans, \$15,527 million, shows a net increase of \$1990 million in 12 months.

## Producibility for New Warplane Designs

(Continued from page 31)

place the conventional 'built-up' beam of a web and upper and lower caps or flanges. Even major assemblies can be made interchangeable through symmetrical design, thus permitting the installation of power plant units, stabilizers, flap panels, elevators, landing gear units, etc., on either side of the airplane.

A reduction in the number of fabricating operations provides important gains in producibility of aircraft. Sheet metal may be punched instead of drilled and blanked instead of routed all in a single hydropress operation. Loose fits and lessened use of carefully mated surfaces can reduce machining time. Allowance of extra material for trim and for reaming critical holes to take next-larger-size bolt can render acceptable parts subject to inaccuracies.

Since assembly operations constitute the greatest manhour costs in aircraft, simplification of these operations makes possible big gains in producibility. The variety of odd-size bolts, screws, rivets, etc., should be reduced and parts designed for assembly through automatic riveting machines, spotwelding or similar one-man operations. Detailed design affords savings in assembly time through the use of attachment fittings whose axis is parallel or normal to the centerline, rather than at an angle. As much of the airplane as possible should consist of "open" sections and designers should avoid the use of boxes, tubes, cells or similar closed sections.

While individual operations may appear simplified to the designer, consideration must be given to the provision of access to assembly operations by a number of workmen at the same time. Splitting the fuselage down the plane of symmetry permits workmen to work on both halves simultaneously rather than crawl in and out of doors, windows or cockpits during assembly and installation. Assembly of the airplane should progress at an even rate with final assembly being deferred as long as practicable. Final assembly, then, will require the joining of only a few major assemblies rather than the old-style method of attaching hundreds of parts in the final assembly stage.

Although sub-contracting is encouraged by the Air Materiel Command as a useful device for speeding manufacture of units in quantity, it must be judiciously used since the handling and assembly of the sub-contracted parts

may require more manhours than its use was designed to save. The design and selection of assemblies to be sub-contracted plays an important role in this balance.

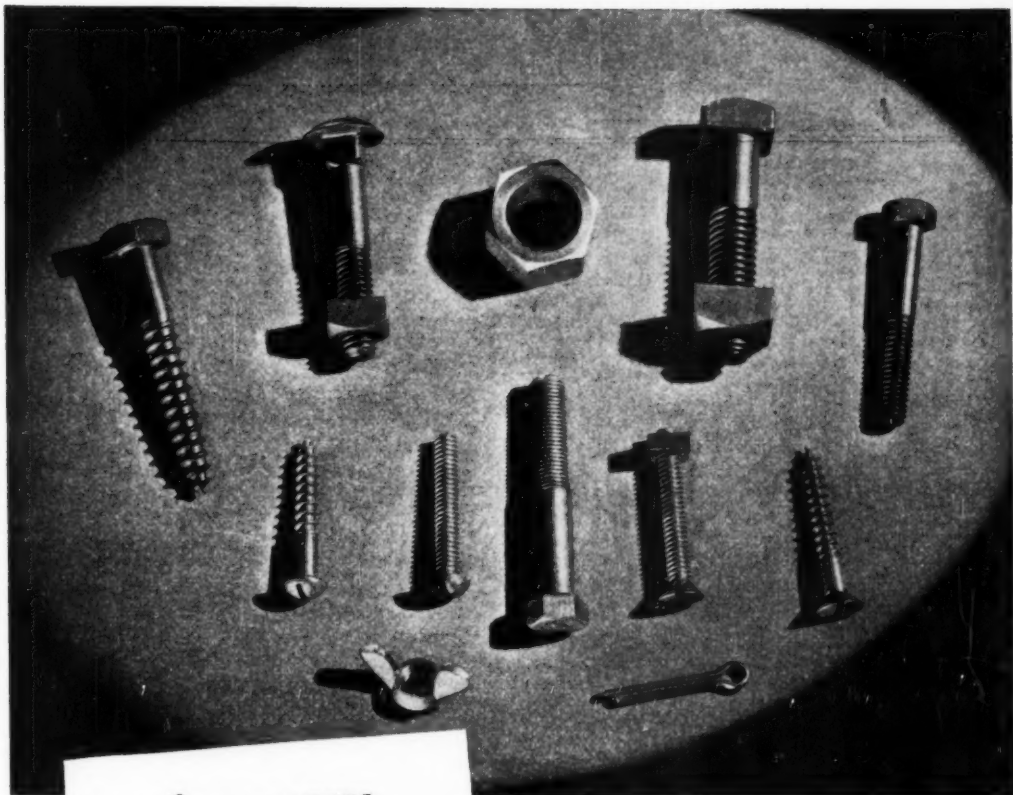
### Standard Parts Program

A basic part of the producibility program is the standard parts program, which is being pressed even more vigorously today than it was during the war. Remarkable progress has been made in this direction, particularly in standardization between Air Force, Navy and Industry standards. The three groups have recently formulated a permanent program, which has already produced 1783 stock items approved by all three with an additional 4333 items scheduled for acceptance this month. The new ANI committee has assigned a number of its standardization projects to SAE Committee E-25, which will shortly complete work on 6116 standard items acceptable to Air Force, Navy and Industry, truly a remarkable achievement.

The effectiveness of the new Air Force producibility program has already been demonstrated by at least two manufacturers, who took an early interest in the problem. Lockheed Aircraft Corp. recently reported a reduction of \$12,000,000 in its bid to the Air Force for a new medium bomber type after restudying the design for producibility. Republic Aviation Corp., in a reanalysis of its F-84 Thunderjet fighter design and production system, found that by redesigning 21 sub-assemblies it could save 86,455 manhours in the production of 1000 airplanes.

Critics of the new program caution Air Force planners that excessive attention to producibility can easily impair the performance of the aircraft, reduce the incentive for development of new processes and methods and destroy aerodynamic design progress. Air Force planners agree with this contention, but point out that extensive studies of captured German aircraft, equipment and plants have convinced them that tremendous strides can be made in producibility without aircraft performance impairment. They believe that low volume production using high volume design and tooling is not necessarily wasteful but can actually produce savings while providing the over-riding capacity for rapid expansion in emergency.

**Read Automotive Industries  
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Pacific Coast: National Screw & Mfg. Co. of Cal.  
1649 18th Street, Santa Monica, Cal.

## Publications Available

(Continued from page 55)

tions help visualize various phases of the product and process involved.

### A-8 Band Saws

The DoALL Company—They Cover the Field is the title of a new 2-color, 8-page catalog which gives a complete size range of 13 high speed DoALL Zephyr Band Sawing machines; includes description, photographs and specifications which are given on an easy-to-read chart. Standard equipment, such as the variable speed drive is illustrated and described, also special equipment for these machines.

### A-9 Multi-V Belts

The B. F. Goodrich Company—A new catalog section on its Multicord and Grommet Multi-V Belts is available. It pictures and describes construction of the belts, gives belt maker numbers, sizes and pitch lengths.

### A-10 Burring, Finishing, Polishing

Weldon Roberts Rubber Co., Brighton Industrial Div.—A new catalog, No. 57, describes and illustrates the three types of Brightboy-Standard, Fine-Tex and Tuff-Tex elastic-rubber abrasive wheels. Tables are included giving the maximum recommended speeds for the various types of wheels, together with specifications. A separate section includes dimensions and prices.

## New Chevrolet Truck Prices

(Continued from page 56)

and on the 4000 Series when 7.50-20 optional tires are specified. Part of this gain comes from the reduction in rear spring camber—about  $\frac{1}{2}$  in. in the 5000, 6100 and 6400 Series; and about 1 in. for the 4100 and 4400 Series.

Although the Thrift-Master and Load-Master engines remain basically the same, they incorporate some improvements reflected in the passenger car engines. Compression ratios now are 6.6 to 1 and 6.7 to 1 respectively, although performance ratings remain the same. Spark plugs have been changed to 14 mm size. Both engines are fitted with a new carburetor having refinements in the accelerator pump to improve reliability. A fast idle combined with the choke simplifies cold weather operation.

Timing gear lubrication has been made more effective through pressure feed, replacing the former practice of gravity feed, thus increasing lubrication at low speeds. On the 3100 Series oil filling and level checking now is made more accessible by filling through the rocker cover and increasing the length of the dip stick, the same as on the other

### A-11 MicroMotors

Redmond Company, Inc.—A revised edition of the company's MicroMotors catalog covers the entire range of Redmond fractional horsepower motors. The various types are illustrated and described and performance and operating charts are included.

### A-12 Conveyors

Link-Belt Company—A new 28-page booklet pictorially depicts a great variety of actual installations of overhead trolley conveyors and shows the adaptability of the conveyor.

### A-13 Water-Hydraulic High Pressure Controls

Hydropress, Inc.—A new folder describing and illustrating water-hydraulic high pressure controls is available. The bulletin deals with hydraulic control valves, stop valves, check valves, etc., for hydraulic accumulators and combinations of valves for sequence operation.

### A-14 Storage of Lubricants

The Texas Company—The January issue of *Lubrication*, company house organ, contains an illustrated article on Storage and Handling of Lubricants. Copies may be obtained from the Sales Dept., The Texas Company, 135 East 42nd Street, New York 17.

conventional truck models.

The ignition distributor has been simplified in detail and improved by the elimination of the polarity reversing switch previously mounted on the starter. The breaker plate—formerly insulated—now is internally grounded while the external stationary contact terminal is eliminated. Condenser capacity also has been reduced.

Molded plastic caps replace rubber caps on the coil-to-distributor wire and at the distributor end of spark plug wires. These caps are more flexible, provide better sealing against moisture and are more durable.

To eliminate possible interference with the installation of certain special bodies or accessories, the fuel tank has been relocated and is mounted at the back of the seat in all cab models of all series.

Borrowing from passenger car design, attachment of the exhaust pipe to the manifold has been changed from a clamped packing type to a flange and gasket joint. The flange is welded to the exhaust pipe and bolted to an angular flange on the exhaust manifold.

## BOOKS...

**MOLYBDENUM: STEELS, IRONS, ALLOYS**, by R. E. Archer, J. Z. Briggs and C. M. Loeb, Jr. Published by Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y. The varied applications of molybdenum as an alloying element are described in this book, which covers a wide range of materials from wrought to cast steels and from cast iron to nonferrous alloys. The major emphasis has been placed on the presentation of the fundamentals that must guide all engineers, designers and metallurgists in their selection of the most suitable materials for a given application.

The scope of the book is illustrated by the main section headings: Technical Effects of Molybdenum, Fundamental Effects of Heat Treatment on Microstructure, Addition of Molybdenum, Wrought Alloy Engineering Steels, Wrought Corrosion Resistant Steels, Wrought Steels for Elevated Temperature Service, Tool Steels, Steel Castings, Cast Iron, Special Purpose and Nonferrous Alloys.

Considerable recent information is included on the more prominent developments, such as the gas turbine steels and alloys; also on the work that has served to clarify the factors affecting the service life of the lower alloy steels. The references to current literature are adequate to facilitate further reading by anyone who desires more detailed data.

It is planned to distribute this book to all metallurgists and others closely connected with the metallurgical industries, free of charge.

**HIGH SPEED COMBUSTION ENGINES**, by P. M. Heidt, N. Yack, N. Y. The text has been completely revised for this fourteenth edition, which contains approximately 50 new illustrations.

Automotive engines have attained such a high state of development that revolutionary changes can hardly be expected. However, engineers continue their efforts to increase the specific output and life, to improve the operating characteristics, and to reduce the specific fuel consumption and the production costs of engines. This leads to the development of new parts and accessories. Among the new items covered in this edition for the first time are steel-injected cylinder head gaskets, fabricated steel piston rings, valves with sodium-cooled head and stem, valve rotators, aluminum and silver-lined engine bearings, a viscous-fluid torsional vibration damper, a speed governor subjected to both centrifugal force and inlet manifold vacuum, and automatically controlled radiator fans. Formulas for the dimensioning of parts in many cases were checked against late practice. Handling of cylinder blocks in transfer type machines, a relatively new production method, is described in the chapter devoted to the manufacture of these parts.

A separate chapter is devoted to two-stroke engines. In previous editions they were included in the chapter on Unconventional Engines but, in view of their popularity for outboard, agricultural and industrial applications, they can no longer be considered unconventional.

The chapter entitled "The Laws of Gases—Thermodynamics" has been omitted from this new edition to hold down the size and cost of the book. This will not impair its value to the average reader since those who use the book as a text in engineering colleges usually have studied thermodynamics previously, and practicing engineers are more interested in the practical aspects of the subject.

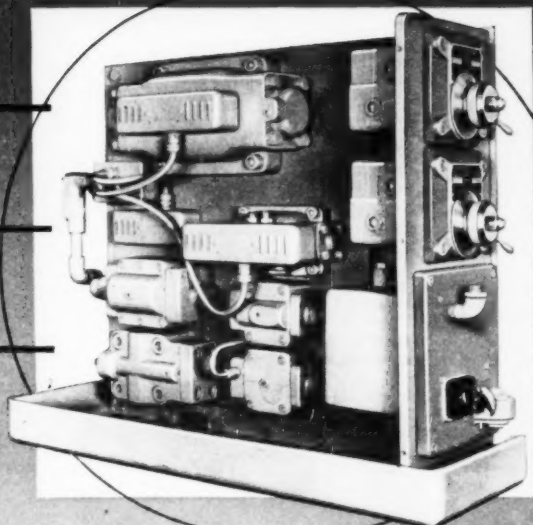


# VICKERS Gasket Mounted Hydraulic CONTROL VALVES

**Simplify Installation**

**Save Space**

**Make Adjustment Easier**

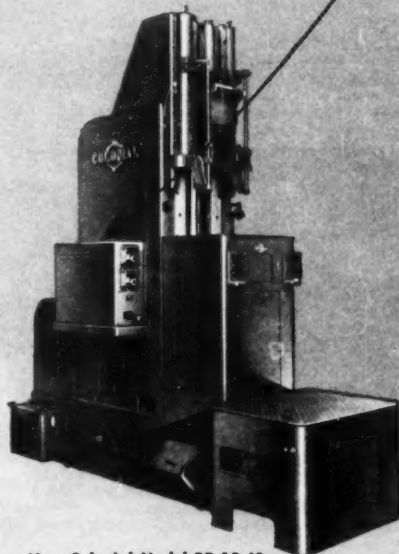


This new Colonial Pull-Down Broaching Machine is an excellent example of how Vickers Gasket Mounted Valves simplify installation, save space and make adjustment easier for hydraulic control systems.

All valves in the panel box are easily accessible for adjustment by simply removing the cover. For cleaning and other maintenance, any valve can be completely removed by just loosening the hold-down screws . . . the piping is not disturbed and the system is not drained. The installation is simplified and more compact because all hydraulic piping connections are made into the opposite side of the machined surface upon which the valves are mounted with sealing ring type gaskets. The concealed piping also results in improved appearance.

Contact the Vickers Application Engineering Office nearest you for suggestions on how Vickers Hydraulic Equipment can improve your machinery.

All hydraulic control units for the machine are included in this group. Flow control valve adjustments convenient to operator without opening panel box.



WRITE FOR NEW BULLETIN, 48-27

This bulletin will give you useful information regarding applications, advantages and installation drawings for Vickers Gasket Mounted Solenoid Controlled Directional Valves.

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New Colonial Model RD-10-42  
Pull-Down Broaching Machine  
has Vickers Hydraulic Controls.



(Continued from page 53)

panded its line of power press brakes to include a complete range of sizes from 120 to 900 tons. This expansion of the line is said to give metal fabricators a choice of models for forming mild steel  $\frac{1}{8}$  in. to 1 in. thick in lengths from 4 to 20 ft.

All sizes except the 120-ton model now employ twin-drive main gears. Back gears in all models operate in oil within an oil-tight case. Precision machine-cut steel gears are used throughout.

All models have motor-driven slide-adjustments with micrometer controls. The slide can be adjusted out of parallel with the base. Slide ways provide full bearing with the housing guides, even when the slide is operated out of parallel. Counters on each end indicate magnitude of the adjustment in thousandths of an inch.

Friction clutch is manually-operated multiple-disc type, and fraction brake is drum-type. Wedge-type release mechanism relieves the ram in case dies are bottomed to the extent that the brake stalls.

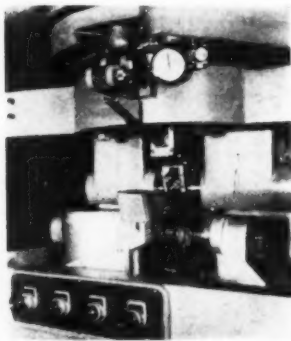
A centralized lubrication system provides positive lubrication to all main bearings. Special high-torque, high-slip motors can be installed with motor-pulley, fly-wheel and V-belt drive fully enclosed.

Standard bending and forming dies, die blocks and tool holders can be furnished and all models can be equipped with removable wide tables for use with wide dies or special punching setups.

### B-6—Gaging Device For Finishing Machine

Addition of a semi-automatic gaging device to its automatic loaders for gear finishing machines has been announced by Michigan Tool Co., Detroit, Mich.

The device, which mounts at the loading end of the chute leading into the machines, consists of two gears used to gauge the pinions being finished and mounted so that they can revolve freely. The center distance between



Michigan semi-automatic gaging device on gear finishing machine



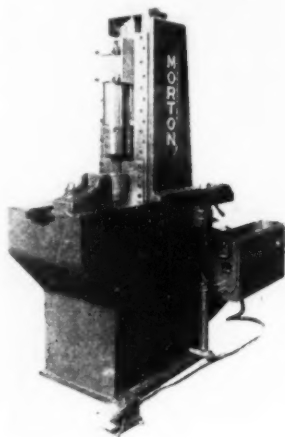
For additional information regarding any of these items, please use coupon on page 55

the two gauging gears is such that a pinion with an oversize pitch diameter, or one on which the stock is excessive for best shaving results, will not drop through between the gears into the chute.

After dropping into the chute, the pinions are picked up one at a time by automatic adaptors (which act as arbors), shaved and ejected into the exit chute—all automatically. The illustration shows one of the pinions in shaving position, the guard having been removed from the series 870 universal Michigan underpass shaver to show the entire mechanism.

### B-7—Vertical Hydraulic Flash Trimmer

A hydraulically operated vertical flash trimmer put out by Morton Mfg. Co., Muskegon Heights, Mich., is used in removing the flash or upset from



Morton vertical flash trimming machine

butt welded small motor frames and other cylindrical parts. It has a capacity of  $4\frac{1}{2}$  in. minimum to 9 in.

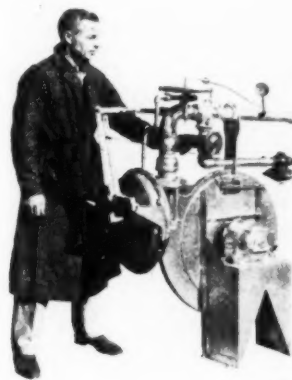
maximum dia. 8 in. length of stroke and stock thickness up to  $\frac{1}{4}$  in. maximum.

The base of the machine contains the hydraulic fluid and operating valves. The upper column provides machined guide bearing surfaces which form the guiding path for the vertically movable cylinder and tool carriers. The cutting cylinder design affords generous rectangular bearing surfaces cast integral with the cylinder housing. The lower cap of the cylinder contains the special relieving clapper box type of tool holder which is provided with horizontal adjustment for positioning the cutting tool in relation to the work clamping dies.

A cutting speed of 50 ft and return speed of 100 ft per minute is provided. The hydraulically operated work holding and clamping fixture may be adjusted toward or away from the back clamping dies to take care of variation in work dia. Automatic operation of clamp, cut, return and unclamp is provided with foot pedal control.

### B-8—Constant Pressure Gas-Air Mixer

A new gas-air mixer called Consta-Mixer just introduced by Vapofier Corp., Chicago, Ill., is claimed to fulfill 98 per cent of all gas-air mixing requirements for industrial heating processes in maintaining a constant manifold pressure to any number of burners regardless of variations in burner requirement.



Consta-Mixer gas-air mixer offered by the Vapofier Corp.

The new mixer maintains a constant mixture ratio at all loads. It handles all types of gas from L.P. (Butane or Propane) to manufactures, and can be arranged for high-low operation. The unit is available in three sizes, No. 2, No. 6 and No. 10, with capacities ranging from a minimum of 35,000 Btu to 2,000,000 Btu.

*Torrington Needle Bearings*

## *Keep Upkeep Down*

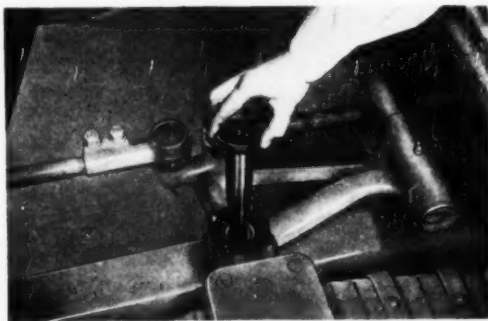
*in Caterpillar Tractors*



Heavy farm chores and tough construction jobs are a matter of course for Caterpillar Diesel DW10 Tractors. One feature owners like is a rugged design needing little upkeep. In governor, steering gear and steering bellcrank, long service life is secured with efficient Torrington Needle Bearings.



The bellcrank application in steering control shows how these high-capacity, anti-friction units fit into compact designs. Two Needle Bearings mounted with close fits keep mating parts in alignment. Freedom from wear maintains close bearing clearances and eliminates the need for readjustment.



Related parts of the assembly are simple—a plain machined bore for a housing, a hardened and ground shaft for an inner race. Fabrication is easy, and installation a quick arbor press operation. No retaining devices are needed. Such Needle Bearing features help keep manufacturing costs down.

Machinery you build or operate can be improved in operation and service life with Torrington Needle Bearings. Consult our engineers on your specific application requirements. THE TORRINGTON COMPANY, Torrington, Conn. or South Bend 21, Ind. District offices and distributors in principal cities.



## **TORRINGTON NEEDLE BEARINGS**

Needle • Spherical Roller • Tapered Roller

Straight Roller • Ball • Needle Rollers

# NEWS of the AUTOMOTIVE INDUSTRIES

(Continued from page 23)

## Keller Accepts Post with ECA

Alexander S. Keller, vice-president and manager of Foreign Sales, Pratt & Whitney, Div. Niles-Bement-Pond Co., has accepted the post of Senior Industry Officer in the Netherlands Mission of the Economic Cooperation Administration. The company is granting Mr. Keller a leave of absence for about a year.

## Churchill Made Head of Studebaker Research

Harold E. Churchill, a Studebaker engineer since 1926, has been appointed director of research in the engineering division of the Studebaker Corp. He has served as assistant laboratory engineer, laboratory engineer, assistant research engineer, research engineer and chief research engineer. He played an important part in the development of the "Weasel," lightweight tracked carrier which Studebaker built during the war.

## New Indianapolis Plant for American Foundry Co.

Steel work is progressing rapidly on the American Foundry Co.'s new \$2.5 million Indianapolis, Ind., plant. It will be one-story high, and will measure 400 by 600 ft. Its capacity will be 25 tons of engine head and block castings an hour for Plymouth automobiles. Completion is scheduled for June 1.

## Wayne Body Co. Plant Closes Indefinitely

The Wayne Body Co. plant at Richmond, Ind., which produces school bus bodies has closed down for an indefinite period. The company has been building bodies for the Metropolitan Coach Co. of Detroit and production had been curbed since the first of November because of a shortage of sheet steel.

## Sieger Elected President of American Welding Society

George N. Sieger has been elected national president of the American Welding Society for 1948-49. He is president of the S-M-S Corp., Detroit manufacturers of resistance welding electrodes.

## Whitman & Barnes' Booklet Highlights 100th Year

Commemorating their 100th anniversary, Whitman & Barnes, Div. of United

Drill and Tool Corp., Detroit, Mich. has issued a booklet, entitled "The First One Hundred Years of Whitman & Barnes," containing highlights of their history.

## Name Beatty Vice President of Campbell-Wyant & Cannon

C. L. Beatty has been named executive vice president of Campbell-Wyant & Cannon Foundry Co. by the board of directors. The board also elected W. R. Krepps as vice president in charge of production; J. D. Vail as vice president in charge of manufacturing; and I. K. MacGregory as vice president in charge of sales.

## UAW-CIO Builds Radio Station at Detroit

The UAW-CIO has added a new outlet for its publicity. The Union has formally dedicated its new radio station WDET in Detroit, and will start officially broadcasting in January. The station will cover all of Detroit and southeastern Michigan, and will feature programs which will include factual news reporting, good music, and entertainment, according to the Union.

## Continental Motors Promotes G. Wayne Thomas

The Continental Motors Corp. has announced promotion of G. Wayne Thomas to chief engineer of the automotive truck and industrial engine division. Before joining Continental in 1942, he was chief engineer of the light truck division of the Mack Co. and prior to that held the same position with the Reo Motor Car Co.

## Ransburg Shows New Film on Electrostatic Paint Spray

A sound film dealing with the electrostatic paint spray process was shown recently by the Ransburg Electro-Coating Corp., Indianapolis, Ind. Among the more recent automotive applications is the one at Studebaker designed for painting large sheet metal parts, which was described on page 22 of the Dec. 1, 1948, issue of AUTOMOTIVE INDUSTRIES.

## Gerity-Michigan Corp. Closes Detroit Plant

The Gerity-Michigan Corp., automotive parts supplier, has notified the UAW-CIO that it will close its Seven Mile Road plant in Detroit. About 500 employees will be affected by the move.

## Ethyl Corp. Raises Price of Tetraethyl Compound

Because of higher costs of metallic lead and other products, the Ethyl Corp. has announced that its tetraethyl lead compound would be increased about seven per cent effective next Feb. 1. Previously, the company had increased its prices on July 1 about 11 per cent, the first increase since April, 1942.

## Bell Aircraft Has \$400,000 Loss in 1st 9 Mos. of '48

A net loss of \$412,531 was reported by the Bell Aircraft Corp., Buffalo, N. Y., for the nine months ending Sept. 30, 1948. The loss for the corresponding period of 1947 was \$381,163. Sales for the current period totaled \$10,907,943, as compared with \$10,645,705 for the first nine months of 1947.

## Form Pattern Makers in Syracuse, N. Y.

The formation of Pattern Makers Inc., Syracuse, N. Y., for the production of all types of pattern equipment has been announced. The officers of the new company are as follows: president, Carl T. Doman, vice-president, Aircooled Motors Inc.; vice-president and general manager, D. L. Smith, former manager of Aircooled Motors pattern shop; and secretary and treasurer, Kenneth Digney, president of Oberdorfer Foundries.

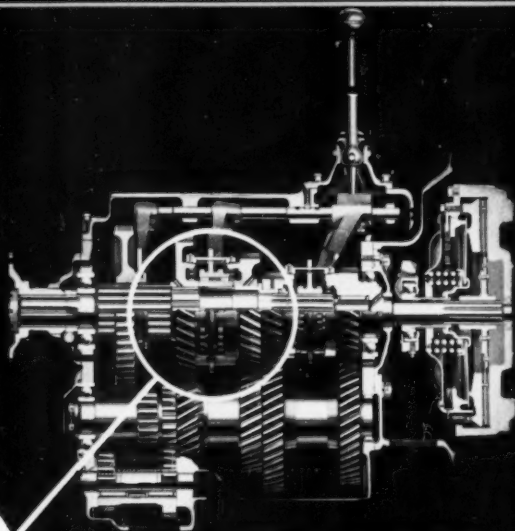
## Bliss Buys Interest in Sheller Mfg. Co.

The E. W. Bliss Co. has purchased 62,500 shares of previously unissued common stock of the Sheller Mfg. Co., manufacturers of automobile and truck parts. As a result, the Bliss Co. will increase its interest in the Sheller concern to 20 per cent.

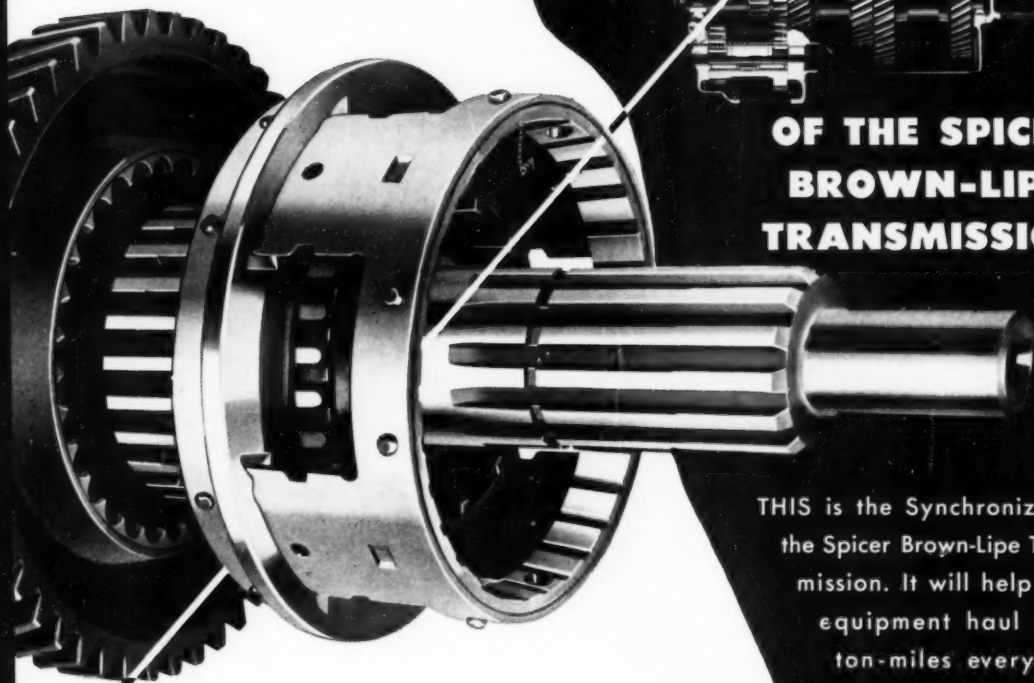
## Buick Hardening Steel Parts by Carbon-Nitrogen Method

GM's Buick Motor Div. has had in production for some time a technique for carbon-nitrogen hardening small steel parts, introducing ammonia gas in the proper proportions with the carburizing gas. This is done in Holcroft gas carburizing furnaces fitted with suitable accessories for nitrogen hardening. Carbon-nitrogen hardening has proved successful in large scale production in the surface hardening of a variety of small miscellaneous parts, formerly hardened by cyaniding.

# THE BRAINS



## OF THE SPICER BROWN-LIPE TRANSMISSION



THIS is the Synchronizer in the Spicer Brown-Lipe Transmission. It will help your equipment haul more ton-miles every day because the engine can put more productive horsepower into the driving wheels.

Fleet owners report major savings in maintenance.

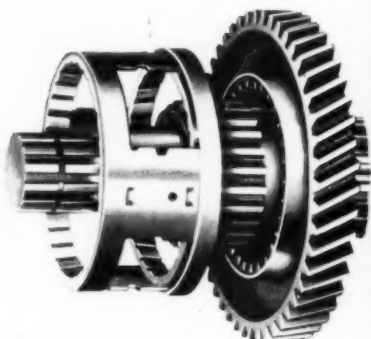


TURN THE  
PAGE, PLEASE

# How The Spicer Brown-Lipe Synchronizer Works



**1** The gear on the main shaft free-wheels until needed, but is always in mesh with the gear train. The main shaft is directly connected to the rear end, and revolves at a speed proportional to the road speed of the vehicle.



**2** The gear is brought to shaft speed (synchronizing it) by pressing a special bronze cone against the mating cone on the side of the gear. This bronze cone is part of a sleeve which is held on the shaft by the shifter gear, being free enough to rock through a small angle.



**3** When the gear is synchronized with the shaft, the shift is made by engaging the shifter clutch, which is shown here. Since the gear is now standing still as far as the shifter clutch is concerned, the teeth are easily pushed into mesh.



**4** This shows the elements as actually assembled . . . Sliding the shifter clutch (view 3) forces the sleeve (view 2) to move ahead of it, under spring pressure. Cone friction turns the sleeve, and the sleeve traps the posts on shifter clutch (posts shown in openings in sleeve). Force on shift clutch now passes directly to the friction cone. Shifter clutch is then held until the cone no longer exerts turning force on the sleeve, after which the shifter clutch slides into tooth engagement.

## SPICER MANUFACTURING

Division of Dana Corporation • TOLEDO 1, OHIO

TRANSMISSIONS • PASSENGER CAR AXLES • CLUTCHES • PARISH FRAMES • TORQUE CONVERTERS  
STAMPINGS • UNIVERSAL JOINTS • SPICER "BROWN LIPE" GEAR BOXES • RAILWAY GENERATOR DRIVES





## Users Eye View of Materials Handling

(Continued from page 34)

material reaches the final assembly line and complete cars appear at the end of this final assembly.

### Conveyor Speed Control

Out of the nearly one thousand conveyors of all types, sizes and kinds in our plants, only thirty are speed controlled electrically. The reason is that there is no modestly priced adjustable speed device that we have considered suitable. Most of the conveyors have mechanical speed adjustment, such as the Reeves Drive, which is seldom changed when once fixed. This drive, I believe, has become almost standard in the automobile industry because any reliable single speed squirrel cage NEMA rated induction motor can be used. We have tried every means possible to utilize standard induction motors.

We have a great many other material handling devices besides conveyors — for example — cranes, hoists and elevators. These together with our machine tools and other equipment are all a-c operated with a few exceptions. We use a-c to save the necessity of maintaining a direct current source.

Our cranes and hoists are standard, as furnished by the industry, with some special adaptations here and there, such as the body handling hoist; often a monorail unit arranged so that the operator can ride along and pick up the body and deliver it to another part of the shop.

In multi-story buildings the elevator program is still most important, notably the choosing of the right elevator for the job, stressing the necessity for the strength of the elevator platform and the necessity for precision in leveling where the jitney with its small diameter wheels are used. A jitney weighs 6000 lb, and requires care in driving onto or from an elevator when pushing a small load ahead of it on the fork.

The jitney or the electrically operated industrial truck is the most used device for handling material in our plants. Power is either a storage battery or a gasoline engine driven generator. These trucks now take many forms adapted to stacking skids, tote boxes, etc. They are much too heavy and weigh as much as they carry, still, they are the most versatile carrier we have.

In conclusion, the problem of material handling of thirteen thousand parts for every automobile we build amounting to at least two million tons per year is a very challenging one and we look to the material handling industry to study constantly our problems with us in order to furnish us with the very latest helps in economical material handling.

presented recently to the Materials Handling Machinery Manufacturers Conference held at Westinghouse Electric Corp., Buffalo, N. Y.

## Aluminum Fenders

(Continued from page 34)

cleaned of all corrosion products, grease, finger marks, etc. This can best be done by sanding and use of a sol-

vent wash. Do not use alkaline paint remover on aluminum.

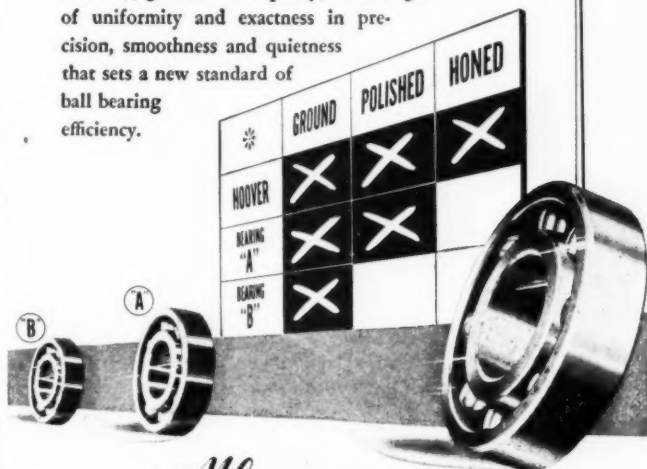
2—Apply warm 5 per cent sodium dichromate or potassium dichromate solution (two ounces dichromate in one quart of water) or Alumiprep No. 44 to cleaned surface. Apply with spray or swab and allow to dry.

3—Apply a zinc chromate primer such as duPont 63-111 or any equivalent material made by a reputable manufacturer. Apply by spraying in a very thin coat. Properly applied zinc chromate primer will be light green in color; yellow color indicates too heavy a coating.

(Turn to next page, please)

## Out front in the Raceway race \*

Hoover Ball Bearings win in the raceway race because they are ground, polished and honed. Hoover is the only ball bearing manufacturer taking the third step . . . honing the raceway. The honed raceway is an exclusive Hoover feature that pays off Hoover customers with 30% longer bearing life, 30% greater load capacity, and a degree of uniformity and exactness in precision, smoothness and quietness that sets a new standard of ball bearing efficiency.



THE ARISTOCRAT  
OF BEARINGS

**Hoover**

America's only Ball Bearing  
with HONED RACEWAYS

HOOVER BALL AND BEARING CO., ANN ARBOR, MICH.

The foregoing article is from a paper

# Productively Generate SURFACE FLATNESS



## MICROFLAT MACHINES



This cast iron valve plate for a refrigeration unit is finished on a double surface Microflat Machine to 8-microinch r.m.s. finish—optically flat and both sides parallel within 0.0001-inch. Production rate is 20 pieces per minute.

**F**INISH flat surfaces, on any material from soft copper to quartz or nitralloy, regardless of the shape or size of the part, in high production. Opposite sides of one or many parts are finished simultaneously on double surface machines,—productively produced to one light band of flatness and within one microinch r.m.s. surface finish. Recessed surfaces may also be finished on single surface machines.

Let us send more information at your request.

### MICROMATIC HONE CORPORATION

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California

616 Empire Bldg.  
206 S. Main St.  
Rockford, Ill.

55 George St.  
Brantford, Ont.  
Canada

Micromold Manufacturing Div.  
Boston Post Road  
Guilford, Conn.



4—Apply duPont 65-1051 gray primer surfacer or 65-1051 red oxide primer surfacer or their equal, to top and underside of fender.

5—Apply finish coats in accordance with standard practice.

6—Apply a coat of asphalt-base sheet metal deadener approximately 1/32 in. to 1/16 in. thick to underside of fender.

## CALENDAR

### Conventions and Meetings

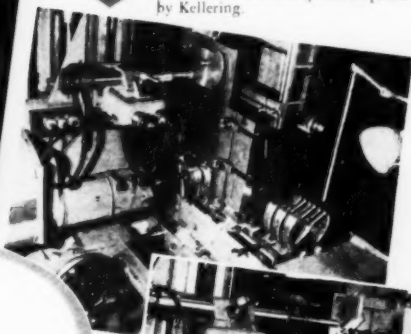
- Nat'l. Assoc. of Eng. & Boat Mfg., Motor Boat Show, New York City .....Jan. 7-15
- SAE Annual Mtg., Detroit .....Jan. 10-14
- Nat'l. Materials Handling Expos., Phila. ....Jan. 10-14
- Amer. Trucking Assoc. Annual Convention, Edgewater Park, Miss. ....Jan. 17-19
- Nat'l. Auto Dealers Assoc. Convention & Equip. Exhibit, San Francisco .....Jan. 24-27
- Nat'l. Council of Private Motor Truck Drivers, Indianapolis .....Jan. 27-28
- 1st Internatl. Auto. Show, New York City .....Feb. 5-10
- Automotive Access. Mfrs. Annual Expos., New York City .....Feb. 7-11
- Amer. Soc. for Testing Materials Annual Spring Mtg., Chicago .....Feb. 28-Mar. 4
- Amer. Soc. of Training Directors, Cleveland .....Mar. 3-5
- SAE Passenger Car, Body, Prod. Mfg., Detroit .....Mar. 8-10
- Amer. Soc. of Tool Engineers Annual Mtg., Pittsburgh .....Mar. 10-12
- Chicago Technical Soc. Council, Annual Production Show, Chicago .....Mar. 14-17
- SAE Transportation Mtg., Cleveland .....Mar. 28-30
- SAE Aeronautic Mtg., New York City .....April 11-13
- Amer. Soc. for Metals, Western Metal Congress, Los Angeles .....April 11-16
- Midwest Power Conference, Annual Meeting, Chicago .....Apr. 18-20
- Salon International De L' Aeronautique, Paris .....April 29-May 15
- Chamber of Commerce of the United States Annual Mtg., Washington .....May 2-5
- Amer. Management Assoc. Nat'l. Packaging Exp., Atlantic City May 10-13
- Middle Atlantic Regional Automotive Show, Phila. ....May 23-30
- SAE Summer Mtg., French Lick, June 5-10
- Amer. Soc. for Testing Materials Annual Mtg., Atlantic City, June 27-July 4
- Amer. Electroplater's Soc. Annual Convention, Milwaukee .....June 27-30
- SAE West Coast Mtg., Portland, Ore. ....Aug. 17-19
- Instrument Soc. of America Convention, St. Louis .....Sept. 12-16

AUTOMOTIVE INDUSTRIES, January 1, 1949

Aircraft parts production on an experimental basis is swiftly and economically accomplished by Kellering such as this.



Another tricky part for experimental aircraft work. Imagine trying to produce parts like this in small lots by any other means. Kellering saves a terrific amount of time and money.



Small lots of aileron control cams are produced with accuracy and dispatch by Kellering.

**"KELLERING"**

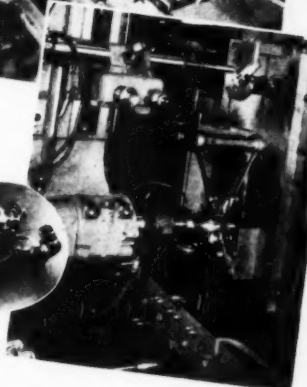
**... A SHORTER WAY OF SAYING**  
**"fast, low cost duplication of parts in experimental lots or for short run production."**

Has it occurred to you that Pratt & Whitney Keller machines offer the one best way to duplicate not only dies, molds and patterns but actual parts, pilot models or production components, however irregular or intricate in shape? If not, you're due to revolutionize your thinking on how to turn out pieces in experimental lots or short runs.

**Kellering is**, in essence, automatic, electric, tracer-controlled milling. Working from an easily made master form, such as a light metal template or an approved part, it reproduces the desired shape faithfully, quickly, economically — in tough alloy steel or other material.

There is a Keller machine for every need. Write for the whole story on Kellering.

Difficult to duplicate? Not for the P&W Keller. It takes this catapult hook in stride.



This Pratt & Whitney Keller, Type BL does the jobs pictured and myriad others. The operator sets up the job and the Keller duplicates every contour of the master form automatically and precisely.



**Pratt & Whitney**

Division Niles-Bement-Pond Company  
 WEST HARTFORD 1, CONNECTICUT



**Keller Machines**

## Significant Developments in Materials Handling Equipment

(Continued from page 37)

Bridgeport, Conn., received from the General Electric Co. at Fort Wayne, Indiana, fractional horsepower motors for use on washing machines which were built at Bridgeport. Prior to the war, about 1939 and 1940, they found that the cost of packaging these motors for inter-plant shipment was high, the difficulty of unloading thousands of in-

dividual packages from the car, placing them into their warehouse awaiting demand by the assembly line, then the rehandling to the assembling line in unit packages, plus the need of tearing open and discarding the cartons as scrap paper, but a very high cost on this motor and its installation on the washing machine.

Investigation proved that it was not necessary to pack these motors in order to keep out dirt, as was first thought by the production engineers, and this resulted in the design of a reclaimable pallet and divider boards, so that the motors could be shipped in unit loads of one hundred per pallet. These were placed on the pallet, twenty to the tier, five tiers high, with a divider board placed between each tier. The entire load was then strapped together and shipped as a unit from Fort Wayne to Bridgeport.

The immediate savings in cartons more than paid for the initial cost of the pallets and divider boards. Remarkable savings were also made in unloading, placing into the warehouse, and reclaiming from the warehouse. At the production line, much confusion was eliminated because the motors were immediately available, without the necessity of discarding hundreds of cartons per day.

As the motors were used up, the divider boards were placed back on the pallets, and then two of these units were strapped together, so that they could be returned to Ft. Wayne for additional shipments. Some of these were used as many as ten or twelve times before damage occurred. Others were used for even a longer period, all depending upon the severity of the handling they received at both plants during movement of these motors.

Today, International Harvester Co. also is utilizing the pallet unit load handling system, and has worked out a system of shipping from the assembly plants to some of its new warehouses, parts and sub-assemblies in unit loads of pallets, so that they can be easily handled and placed in storage at the lowest possible cost.

Many pallets have been designed, but last year there was a trend toward the development of an expendable pallet—a pallet that could be used one or more times, depending upon the urgency of the shipment, but at least could be thrown away without any great loss at the end of the first trip, if necessary. Since then, some of these special pallets made of paper products, etc., have been placed under severe tests, in actual operating conditions. These will be featured at the Materials Handling Exposition in Philadelphia.

The expendable pallets must be designed to meet the requirements of particular shipments, because water, humidity, heat and cold have to be taken into consideration when the materials are placed in storage. The weight of the material to be handled, and the height to which it must be stacked in warehouses are a determining factor of the type of pallet to be used.

However, engineers are now working out package designs so as to eliminate the necessity of using pallets, and on certain unit shipments such as automobile engines, wheels, and large bulky

(Turn to page 72, please)

# GUNITE

truck wheels...

*for better trucking*



FRONT AND DUAL REAR  
IN 20", 22", AND 24" SIZES  
TO FIT MANY POPULAR  
TYPES OF TRUCK AXLES

MADE BY  
**GUNITE FOUNDRIES**  
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**GUNITE Cast Wheels**—both Truck Fronts and Truck Dual Rears—are made with many distinctive design features for greater strength, safety, and durability. These include deep-spoke structure that provides practically straight-line stress transfer from rim to outer bearing; extra-wide, non-slip lugs on floating rim bolts; and ventilated spacer (on rears). Gunites are made of strong, controlled-quality cast steel (except for 20" fronts, which are malleable iron). Accurate machining assures proper fit on standard axles. Famous Gunitite Brake Drums are integral parts of these cast wheel assemblies. **Buy GUNITES—for better trucking!**

GUNITE WHEELS ARE CAST AND FINISHED IN GUNITE'S OWN FOUNDRIES AND MACHINE SHOPS

# ONLY PHILLIPS RECESSED HEAD SCREWS



are available  
from **MULTIPLE**  
sources of supply

With the cross recessed head screw rapidly becoming the preferred screw for all types of industrial assemblies, it is all-important to be sure that present and future needs can be supplied.

Since Phillips is the only cross recessed head screw with *multiple* sources of supply, Phillips Screws are your logical choice. And this is just one of the five important reasons why *only* Phillips Screws give you *all* the advantages of the cross recess design.

## Get this new Fact-Full Booklet

that lets you in on the important facts you can't afford to overlook when you choose cross recessed head screws. It's FREE. Use the coupon.

GET ALL THE ADVANTAGES OF ASSEMBLY  
WITH CROSS RECESSED HEAD SCREWS...

## PHILLIPS Recessed Head SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

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National Screw & Mfg. Co.  
New England Screw Co.  
Parker-Kalon Corporation  
Pawtucket Screw Co.  
Phillips Manufacturing Co.  
Rapid Screw Co.  
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Russell Burdall & Ward  
Bolt & Nut Co.  
Seawall Manufacturing Co.  
Seaboard Screw Corp.  
Shakeproof Inc.  
The Southington Hardware Mfg. Co.  
The Steel Company of Canada, Ltd.  
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Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

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AA-37



items, the container itself becomes the pallet or unit load for handling by means of fork trucks. It does not matter whether pallets are used or not, as long as the container can be picked up and lifted without the necessity of employing additional labor.

A number of accessories have been developed for use with the fork truck, to accomplish this result. These are known as various types of "load-grabs", operating on a hydraulic system, which is a part of the power unit of the truck. These grabs, with special types of arms, can be used for picking up wood cases, cardboard cartons, drums, or any type of container which can stand side

pressure without collapsing, and without damaging the container or merchandise within the container. These units were first shown in the Materials Handling Exposition in 1948, and since then many new developments have been made, which will be displayed at the Third National Materials Handling Exposition.

A recent unit shows the possibility and practicability of picking up bagged materials without the need of using pallets. This is quite a step forward, and one which should be of interest to the automotive engineers, because tires, wheels and many other items which will not lend themselves to palletizing or

unit-load packaging, can be strapped or wired together in such a way that they can be picked up by means of a grab, or special attachment on the fork truck.

Other devices which will be featured are special loaders for handling bulk materials in unloading box cars, in dispersing bulk materials into a storage area, or reclaiming them for use in production such as foundry sand, coal, coke, etc. More and more stress will be placed upon containers for handling of scrap metals, machine chips and borings. These will be special containers which can be picked up on attachments, placed on regular motor truck chassis, or on small industrial tractor chassis. The advantage of these units again is in the reduction of multiple handlings, and the elimination of transferring from one type of container to another, through several operations.

End gates or elevators for motor trucks have been improved over the years, and the new developments in this connection make it possible to handle heavier loads, have a larger load area on the elevating end gate, and to lift higher than was previously considered possible. These units will be displayed at the Exposition this month.

The use of an elevating end gate or elevator as part of a motor truck has several advantages. It can always be with the truck, whether the truck is operating within the plant, at the railroad station, or delivering merchandise to a customer who has no unloading platform. It is useful for working within the plant between buildings where different types of platform levels are encountered.

Other units will be displayed which have been locked in secrecy and not made public, nor will the news releases appear until after the Exposition in January, 1949.

Industry, and particularly management of industry are at last beginning to recognize the need for devoting more time to the art of handling materials. The emphasis that was placed upon materials handling by the Armed Forces during the war years, and in Government and private plants, to increase production and speed up many operations, as well as to increase our war potentials, has definitely proven that this is one place where savings can be made, and at the lowest initial capital investment.

Frequently, conveyors have paid for themselves within less than six months after their installation, and these conveyors are the type that are used within production operations for tying several production units together. It has been found that by using these conveyors, all machine production operations have been stepped up in speed, because there has always been material available for feeding the machines, and the finished product is quickly transported away by means of the conveyor to its next step in the production line.

(Turn to page 74, please)

## ***Thew-Lorain says— "Pile on the Weight!" TUTHILL SPRINGS can take it!***

Thew-Lorain Moto-Cranes rely upon tough Tuthill Springs to handle those tremendous shovel and crane loads... easily... smoothly. Standard equipment on Thew-Lorain and other leading heavy duty vehicles. Tuthill Springs represent 70 years of successful experience in spring development and manufacture.



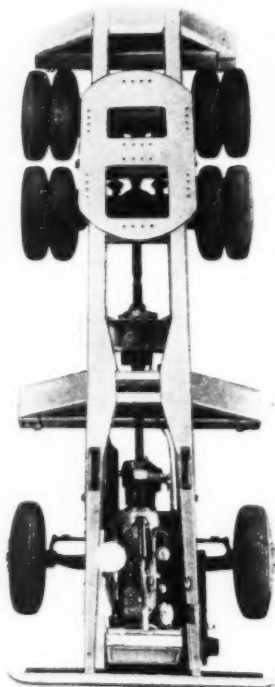
Closeup view of powerful TUTHILL Leaf SPRINGS supporting front axle of Thew-Lorain Moto-Crane.

A COMPLETE LINE of leaf springs to meet most requirements. Specially built springs upon request.

Write for Complete Details on Tuthill Springs Today

# **TUTHILL SPRING CO.**

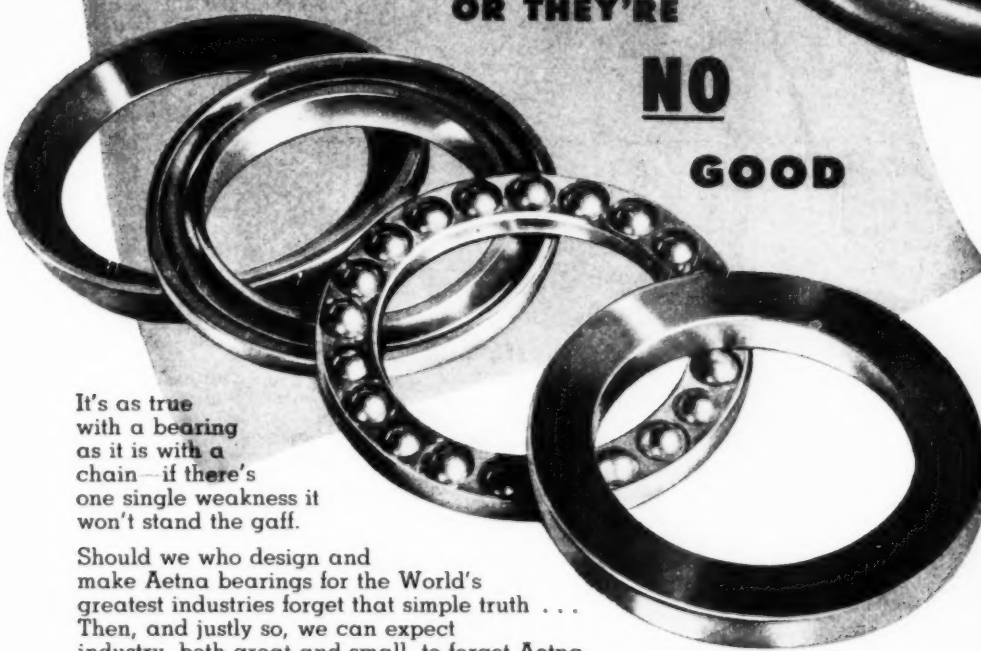
760 WEST POLK ST. • CHICAGO 7, ILLINOIS





THEY MUST  
BE **ALL**  
**GOOD**

OR THEY'RE  
**NO**  
**GOOD**



It's as true  
with a bearing  
as it is with a  
chain—if there's  
one single weakness it  
won't stand the gaff.

Should we who design and  
make Aetna bearings for the World's  
greatest industries forget that simple truth . . .  
Then, and justly so, we can expect  
industry, both great and small, to forget Aetna.

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**Aetna**

**AETNA BALL AND ROLLER BEARING COMPANY**

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In Detroit: SAM T. KELLER: 2437 WOODWARD AVENUE



STANDARD AND SPECIAL BALL THRUST BEARINGS •  
SPECIAL ROLLER BEARINGS • ANGULAR CONTACT  
BALL BEARINGS • BALL RETAINERS • HARDENED  
AND GROUND WASHERS • SLEEVES • BUSHINGS

Conveyors in sub-assemblies and for feeding to the assembly line have long been in use in the automobile industry.

The automobile industry was able to take the principles of continuous handling from the meat packing industry, and apply it to the manufacture of automobiles, to such an extent that at one time, the automobile companies were the outstanding example of this type of materials-handling equipment. However, not all companies have kept pace with the new improvements which have been made in the tractor trailer system, in special trailer units, and in the use of the fork truck, pallet and unit-load idea.

Other industries have used the conveyor method to considerable advantage, and the writer knows from experience over a great many years that no conveyors were purchased by industry unless they could pay for themselves by direct savings, within a period of 18 months. These savings have been continued through the years as additional profit, because the conveyors have lasted more than the 18 months, and with a very low maintenance cost.

The same is true regarding such units as fork trucks, cranes, tiering machines, etc. They are not purchased unless the survey shows that the savings effected will pay for the unit with-

in a year or less. However, most of this equipment is not obsolete nor worn out even after a five-year operating period.

A fork truck that cost \$7000, when placed on one materials-handling operation, returned a savings of \$7000 over a period of four months. Many instances of this kind could be cited.

In addition, the use of materials-handling equipment reduces the accident hazard, increases the efficiency of all of the workers, makes for better housekeeping, simplifies the task of taking inventory, and speeds up the movements of materials in process so that the time required for inventory of materials in process is reduced.

All of these are direct savings, attributable to materials handling. It has been said that at least 25 per cent of the production dollar can be saved by properly studying materials-handling methods and installing modern materials-handling equipment.

Industry has at last awakened to the need of studying the various handling operations within its plants. The fact that there have been three national materials handling expositions in three consecutive years, and each exposition larger than the previous one, and better attended than the previous one, is an indication that this important subject is being given the consideration which it merits.

## Materials Handling In Aircraft Plants

(Continued from page 41)

capital expenditure. We have in mind a case where an overhead, over-all crane system was proposed at a cost of \$60,000. This expenditure would have imposed a burden on a given contract of over \$2000 per unit produced. However, in a complete study and analysis of the problem, it was found that the rearrangement of existing monorail, combined with the addition of a few more of the same type, the job could be done for about one-sixth the cost of the crane system. The problem will always be thus, and until larger volume of business combined with buildings to match the size of product are available, the mechanized handling methods in the aircraft industry in all probability will remain as they are.

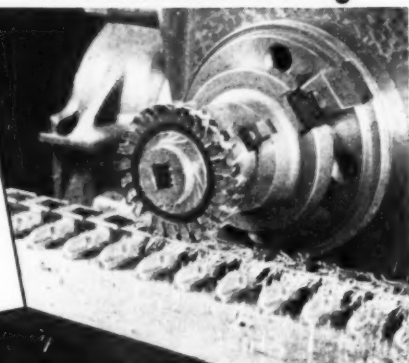
### (G) Other Factors.

It must be acknowledged that the aircraft industry has been and may continue to be in a state of flux, due to many factors, but especially because of the changing pace to meet the advancements of new developments and various economic conditions.

The other factors as outlined, such as condition and type of floor, arrangement of the plant, construction of buildings, and distance traveled are, in most instances, within the control of those persons responsible for either plant layout, maintenance, or production.

## A NEW HOLDING METHOD for Production Milling

Because of the small size of these castings it was difficult to clamp them satisfactorily. Time study had established set-up for this job, mounting 6 up for a time in conventional pieces at a time in conventional fixture with 15 clamps. A Rockford Power-Grip chuck was substituted for the fixture, and 23 parts were located and held in a fraction of the former time. A net increase of 400 pieces per hour resulted.



## ROCKFORD POWER-GRIP MAGNETIC CHUCK INCREASES MACHINE OUTPUT 5 TIMES

The deep magnetic penetration does it. This entirely new and different principle of concentrating and directing magnetic flux supplies Rockford Power-Grip chucks with an intense holding power. Applied to suitable work in milling, turning, shaping, planing or grinding operations, this holding method offers advantages in convenience, ease and time savings over conventional chucks and fixtures.

### Increased Safety Factor

Rockford Power-Grip chucks are operated on 6 volt D.C. current, rectified from standard A.C. Rectifier and switch control are furnished with each chuck. Any danger to the operator, tendency to arc over, or possibility of chuck failure are consequently eliminated. Full insulation in addition to low voltage requirements make them absolutely dependable in either wet or dry operations.

### Methods Engineers

This new deep magnetic penetration method is rapid, easy and economical for production holding problems, as well as general tool room work. Get the complete story. Write today for a copy of our latest bulletin Magnetic Holding Methods.

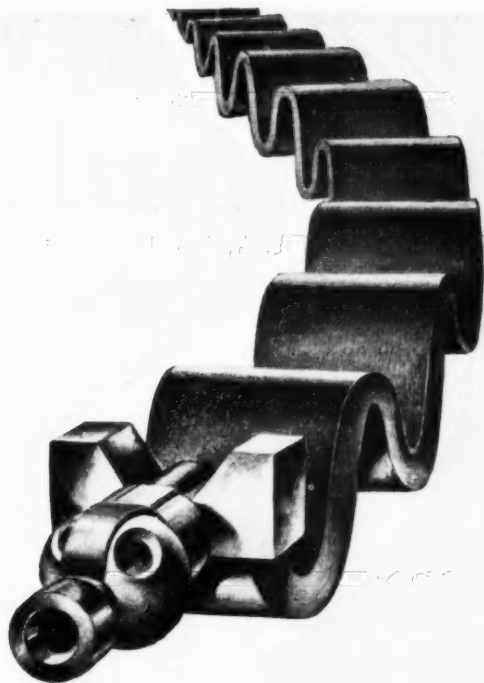
Send prints and description of your work for complete proposal on Power-Grip Holding. No obligation.

**ROCKFORD**



**ROCKFORD MAGNETIC PRODUCTS CO. INC.**  
1314 18th AVE. ROCKFORD, ILLINOIS

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# The Blitz-wizzer...

**a real  
challenge!**

This engineer's daydream, the Blitz-wizzer, is a tough one to cast all right. But if you really asked Campbell, Wyant and Cannon to produce Blitz-wizzers, and a lot of them, we could probably do it. For CWC faces a new Blitz-wizzer of a casting problem nearly every day. And we train upon it the full resources of our metallurgical engineering (forty years' experience) . . . our precision-controlled casting processes . . . and our highly mechanized production. And so the problems get solved, and often products that never before were *cast*, are cast by CWC, successfully and economically.

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SOUTH HAVEN, MICHIGAN: National Motor Castings Div. • LANSING, MICHIGAN: Centrifugal Fusing Co.

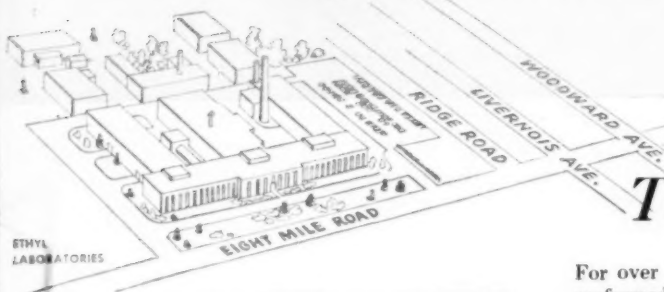
**CWC**  
1908-1948

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# When in Detroit,\* visit the Ethyl Laboratories

\*At the SAE Convention (Jan. 10-14)  
or on your next business visit.

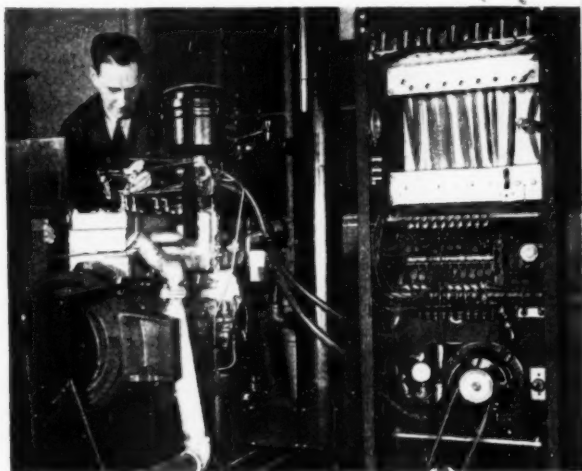


*They are designed*

For over twenty years the Ethyl Laboratories have performed an indispensable function in the organized research of the automotive and oil industries, which continuously brings better and more economical automotive transportation to the American people.

The present modern laboratories incorporate much

## THREE EXAMPLES OF



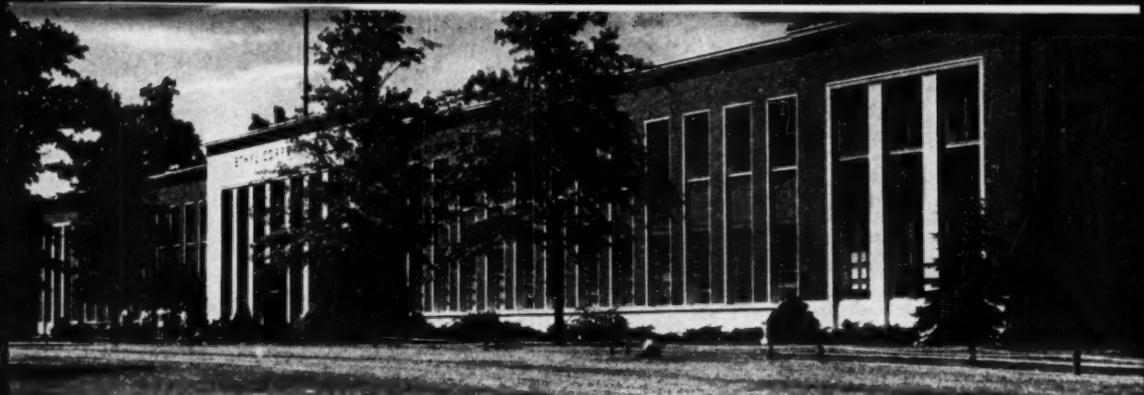
**THIS PLASTIC HIGHWAY** enables Ethyl engineers to "bring the road into the laboratory." A combination engine and dynamometer control makes it possible to duplicate on the dynamometer stand the sequence of engine speed and loading recorded during any actual trip on the highway. The control equipment utilizes a plastic tape and operates on the principle of the familiar player piano.

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CORPORATION**

View of Detroit's fine shopping district—looking up Washington Boulevard.







Ethyl Corporation's modern research laboratories on Eight Mile Road in uptown Detroit—twenty-five minutes from Washington Boulevard.

## *to serve the oil and automotive industries*

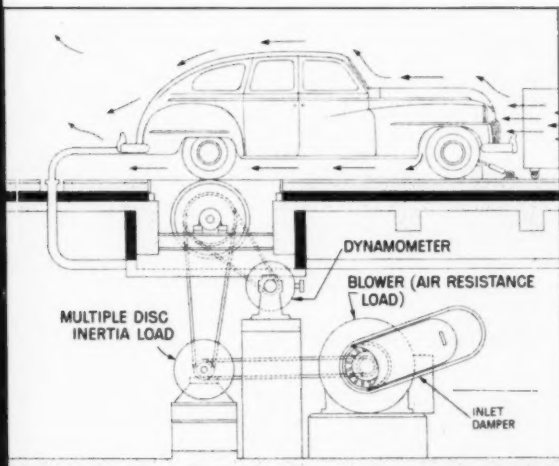
special equipment with many unique features which are of interest to technical people in petroleum and automotive companies.

New tools and techniques are continuously being developed at Ethyl Laboratories for the express purpose of better solving the interrelated problems of engines,

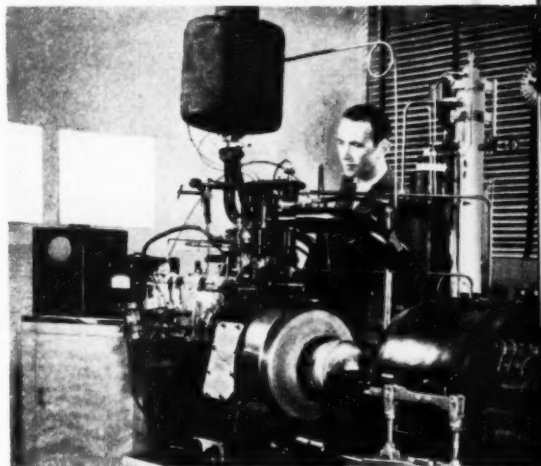
fuels and lubricants, in the never-ending search for better and more economical fuels.

Ethyl Corporation cordially invites technologists of oil, automotive and related companies to inspect the Ethyl Research Laboratories and to discuss problems of mutual interest.

### **SPECIAL EQUIPMENT IN THE ETHYL LABORATORIES**



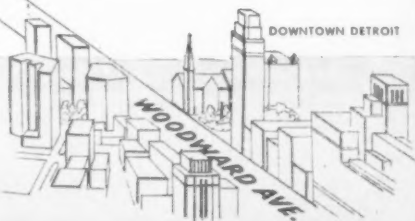
**INDOOR "ROAD" KNOCK RATINGS** may now be obtained on the rolls of this chassis dynamometer provided with special automatic control equipment developed by Ethyl Laboratories. Speed-time relationships for accelerations run on these rolls duplicate those obtained on the road. Knock ratings made on the rolls are essentially the same as those made on the road, and their reproducibility is better.



**SPECIAL SINGLE-CYLINDER ENGINE** studies indicate fuel antiknock performance under conditions including wide ranges of speed, manifold pressure and compression ratio. The extreme flexibility of this special engine makes it possible to rate experimental fuels under conditions which appear likely to exist within the cylinders of engines of the future.

### **RESEARCH LABORATORIES**

1600 West Eight Mile Road, Detroit 20, Michigan  
2600 Cajon Road, San Bernardino, California



# Materials Handling in Mass Production

(Continued from page 39)

considering that automatic loading and unloading of gear cutters, grinders, automatic lathes, and other high cycle operations has been practiced for many years. The application of the principle to the automatic handling of stampings, however, charts a new trail. For these stampings are large and irregular, awkward to handle by any means. Automation at Ford goes beyond the desire to reduce production costs. By

mechanizing the handling of large stampings Ford has just about eliminated the usual hazards associated with operations of this kind, thereby freeing the workers of the risk of injury.

Early in 1947 the Plymouth Division, Chrysler Corp., released information on its contribution to automatic handling of materials. Here the overhead conveyor lines carrying bodies and chassis frames and engines to the final assem-

bly line were provided with a unique system of guide rails which served automatically to release the work at the proper moment, thus permitting the assembly to drop in place on the conveyor. Exceptional ingenuity was exercised in connection with the body drop since the body had to be lowered in such fashion as to thread it over the steering column. With this arrangement, Plymouth has a control panel on each line to enable an operator to properly synchronize the speed of the overhead conveyor with that of the final assembly line.

Later in 1947 when the new Chevrolet assembly plant and Fisher Body unit were placed in operation at the outskirts of Flint, this installation included another "first"—a "suspended" final car assembly line in which car assembly is built up while the work is moving on a monorail conveyor. Here too certain sections of the line moved work automatically.

In large volume production of parts such as electrical and ignition components, for example, great strides were made recently in mechanizing the entire materials handling system and giving it automaticity to a large extent. One important example is found at Delco-Remy in Anderson, Ind. The sequence of assembly operations for parts such as coils, condensers, armatures, distributors, generators, regulators, etc., is laid out in orderly fashion on assembly benches of various types. A feature common to most lines is the use of a belt conveyor to carry component parts to the assembly stations. In other cases, where it is more expedient, the parts are transported to the line on monorail conveyors. Similarly, some parts such as distributors, for example, are assembled on fixtures mounted on table high conveyors and are moved progressively from one station to the other.

The Delco-Remy plant today is a veritable maze of highly organized assembly lines and materials handling devices, moving in orderly fashion and without manual effort. It is of interest to find that where secondary operations such as welding or soldering or crimping are required on the parts in process, the equipment for such operations has been moved in as a part of the assembly line and so arranged as to be fully automatic in action.

About mid-Summer in 1948 the New Departure Division, GMC, opened its automotive ball bearing plant in Sandusky, Ohio, said to be the first plant designed exclusively for the mass production of ball bearings. It features an amazing variety of materials handling devices including, monorail conveyor lines linking the machine shops; con-



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ARE THOROUGHLY  
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DEGREASERS AND SOLVENT

**NIAGARA**  
METAL PARTS WASHERS

# *it's little things that count*



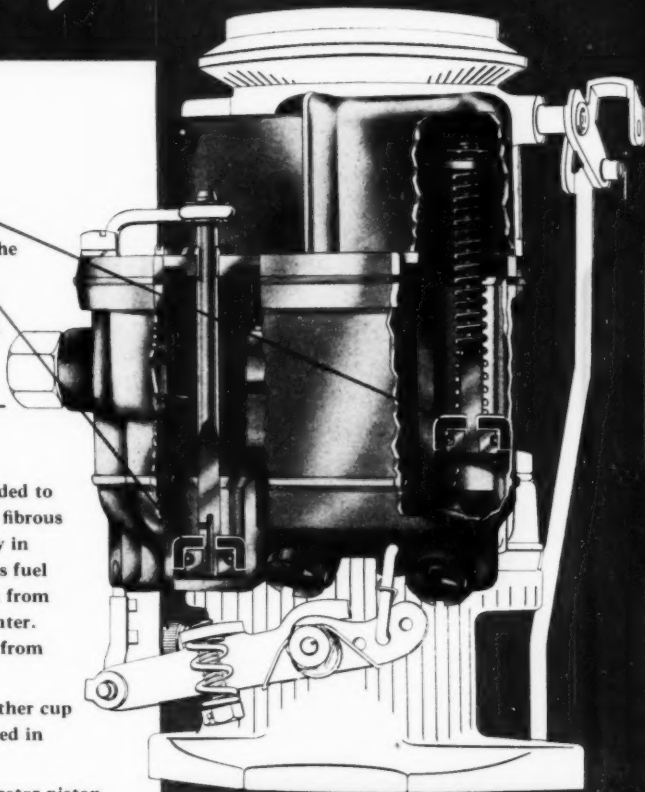
Like that little squirt of gasoline, when you want quick starting and fast pick-up. And the little piston pump packing which helps you get it. In Stromberg carburetors (made by Bendix Aviation Corp.), special care is taken to assure complete dependability of every component part. In model BXVD-3, for instance, two leather cup packings are used—one on the dash pot piston and the other on the pump piston.

These cup packings must be accurately molded to size; they must *stay* wrinkle-free; and their fibrous texture must have that tightness found only in prime calfskin. These cups must not by-pass fuel or become logged; they must neither shrink from heat nor freeze to their cylinder walls in winter. Their leather tannage must not deteriorate from contact with oils or gasoline.

Non-deteriorating *chrome* tanned Sirvis leather cup packings, made by Chicago Rawhide, are used in thousands of Stromberg carburetors.

Chicago Rawhide engineered the first carburetor piston pump packing to deliver satisfactory performance. Today, they are used in many leading makes. Because of constant research and product development, precise laboratory control, highest standards of leather quality, and exceptional care in every phase of production, Chicago Rawhide's Sirvis leather piston pump packings continue to be the most dependable.

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*"Our CLARK 'Yardlift-40' puts dump bodies in storage and brings them into the shop for mounting, at a fraction of the former cost . . . solving a serious problem. It more than doubled storage capacity. We are finding new uses right along for this great money-saver."*

E. W. Luger, President  
VOLTZ BROTHERS, INC.  
Chicago, Illinois

Experiences like this, more and more frequent throughout industry, point to the new science of Materials Handling as the savings-bonanza for which business has been prospecting.

To exploit your opportunities for savings on materials handling, take advantage of Clark's matchless experience. It's "good business" to CONSULT CLARK.

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INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 85, MICH.  
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD  
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

tinuous belt conveyors linking grinding operations; automatic loading, unloading, and storing of parts at centerless grinders. The assembly area has a series of self-contained belt conveyor lines which start at the head of the department, run through the finish-grinding lines, continue through inspection and grading and selective matching stations, and later constitute the final assembly line to the terminus of each department.

As demonstrated at Ford on its piston machining line and at New Departure, a system of belt conveyors linking a given department or battery of automatic machines can be used as a means of automatically feeding and unloading such equipment through the use of deflectors placed over the belt. These deflectors force the flow of parts off the belt and then by chute to the in-feed mechanism of an automatic machine. On the Ford piston line, for example, an entire battery of some seven or more Cincinnati Centerless grinders runs day in and day out without operator attention save for one man who scans the bay continually. Pistons feed into each machine from the belt on one side, eject the work through a chute to another belt on a lower level, the latter then carrying the parts to the next operation.

Many plants operate extensive fleets of industrial trucks of every kind—lift trucks, fork trucks, tiering trucks, platform trucks, etc. These are used for interdepartmental hauling, for installing and removing press dies, for loading and unloading heat treating furnaces, for transporting sheet steel in bundles and coils. One of the latest applications is the use of industrial trucks for transporting palletized loads.

Chevrolet, Ford, and other manufacturers have adopted the palletizing procedure. By using a standard method of stacking and binding, otherwise awkward parts such as cylinder blocks, transmission cases, axle shafts, rear axles, etc., are organized in a compact and orderly package. The raw parts are delivered to the machine lines in palletized form; while finished parts received from the outside or consigned to storage within the plant are transported and stored in palletized form from start to finish.

As demonstrated by Chevrolet and Dearborn Motors (the Ford tractor operation) palletizing has reduced handling costs amazingly, has organized the loading and unloading of trucks and trailers and freight cars so as to hold more parts in the same vehicle on the one hand, while simplifying unloading and storing, on the other.

Introduction of transfer machines in many large production plants has brought with it automatic transfer mechanism within each machine. And this has reduced manual handling to the vanishing point in such machine shops.

Ingenuity has solved the problem of



## Adjustable Blade Chasers

FOR THE NAMCO STYLE DBS

VERS-O-TOOLS

For Brown & Sharpe Automatics



New chaser, with holder offset to left; cutting edge up to proper working position.



Reground chaser, with holder offset to right to compensate for wear; cutting edge still up to proper position.

### 4 OUTSTANDING ADVANTAGES

1. Only available adjustable-for-wear blade chasers (with provision for diametric adjustment).
2. Same accurate chaser grind checking (with Namco Micro-Gage).
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Here is an entirely new product. Nothing like it has ever been offered before, by any manufacturer.

For the first time, the proved advantages of adjustable blade chasers are available to users of Brown & Sharpe Automatics. The same Namco Style DBS Vers-O-Tool, already famous with circular chasers, will further cut your threading costs by the use of the lower-priced Namco adjustable blade chasers for medium and short-range lots.

An exclusive design feature of the adjustable blade chaser is the provision for take-up of block after each grind. Chasers are always up to proper cutting position.

With this unbeatable combination you have the latest in 1949 threading equipment—to meet the tougher price competition of 1949 markets. May we quote costs on this important modernizing step for your machines?

Adjustable-for-wear-Blade Type Chasers are also used in Namco DR & DS Vers-O-Tools and are interchangeable—die size for die size.

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Acme-Gridley 4-G and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids • Centrifuges • Contract Manufacturing



assembly lines for making large sub-assemblies and final assemblies such as —body side panels, roof panels, complete bodies, etc. For reasons of space limitations as well as for better coordination of tasks, many plants — for example, Hudson, Nash, Briggs, and others — have laid out these assemblies on closed merry-go-round conveyors. Here the massive framing fixtures travel on a power driven floor conveyor around the closed circuit at an established pace.

More recently many machine shops have installed extensive systems of chip conveyors, while press shops have

adopted underfloor conveyors for moving sheet metal scrap from the press lines to the baling machines. On machine lines the operation is completely automatic since each machine is arranged to reject the chips and turnings through a chute to the conveyor. This material is moved continuously and automatically to the salvage department.

Hoists and cranes are used in tremendous numbers in the industry for heavy lifting tasks, for unloading freight cars, for removing parts from machines or off assembly lines.

Space does not permit even a sam-

pling of all applications of advanced materials handling methods and equipment. For instance, the foregoing has touched only on machine shop and assembly operations. Foundries are similarly mechanized, employing materials handling devices unique to such operations. Here are found extensive systems for handling sand, for loading cupolas, for reclaiming sand, for knock-out and cooling conveyor lines, for salvaging gates and sprues.

The variety of materials handling installations designed to suit specific applications in the host of plants which constitute the vast automotive industries is endless and amazing. It represents a chapter of manufacturing activity that deserves extended treatment. Certainly even this sketchy outline demonstrates that materials handling is today essential to mass production. Its initial contribution as a supplementary aid or labor saving device is a phase that disappeared before the war.

Some references dealing with advanced systems of materials handling published in **AUTOMOTIVE INDUSTRIES** during the past year or so are given below.

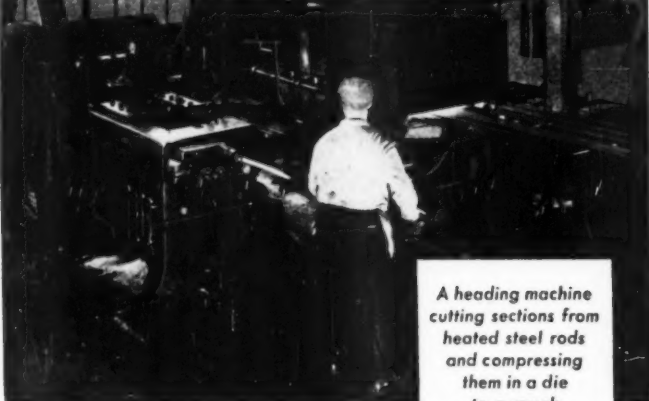
- 1—Plymouth Division  
Production "Firsts" at Plymouth's Enlarged Plant ..... (AI, 4-1-47)
- 2—Fisher Chevrolet  
Ultramodern Production Features at Chevrolet's New Flint Plant (AI, 8-15-47)
- 3—Delco-Remy Division  
Delco-Remy Introduces New Facilities for High-Volume Minimum-Cost Production ..... (AI, 11-1-47)
- 4—Dearborn Motors—Ford Tractor  
Materials Handling a Prime Factor in Ford Tractor Production.... (AI, 1-1-48)
- 5—Nash Motors Division  
Nash Prepares for 1949 Production ..... (AI, 7-15-48)
- 6—New Departure  
Million and a Half Automotive Bearings a month ..... (AI, 8-1-48)
- 7—Ford Automation and The Iron Hand ..... (AI, 11-15-48 and 12-1-48)

#### **American Standards Revises Safety Glass Codes**

The development of new types of heat absorbing safety glass for motor vehicles has brought about a change in the tests for safety glass approved by the American Standards Association. The new types of glass are used in vehicles that are air conditioned for service under high temperatures. Sponsored by the Association of Casualty and Surety Companies (Accident Prevention Dept.), and the National Bureau of Standards, under the procedure of the American Standards Association, a committee of 25 national organizations has prepared the American Standard Safety Code for Glazing Motor Vehicles Operating on Land Highways, and the revision, American Standard Decoloration Test for Safety Glass.

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**STROM BALLS are Born**



**A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape**

The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

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**7,200 Pieces**  
**per hour**

**from 1 $\frac{1}{8}$ " x .042"**  
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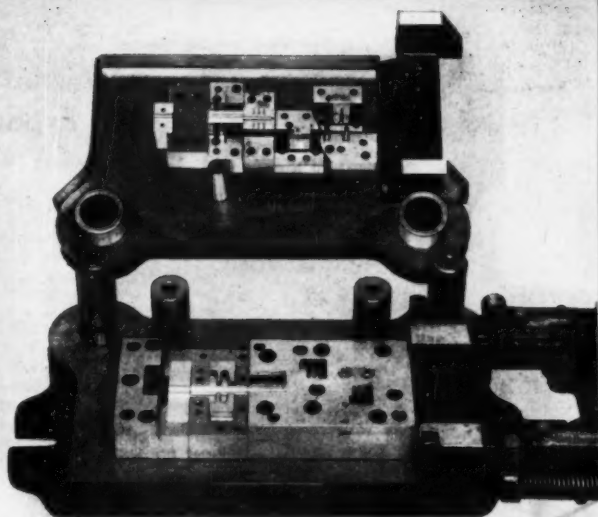


Photo courtesy of Federal Tool Corporation, Chicago

**... using**

# DANLY Precision Die Set

**Tolerance of .001" held on 10-station progressive die**

**save  
time**

**USE DANLY NATION-WIDE  
DIE SET ASSEMBLY SERVICE**

Assembly plants (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to your specifications.

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- \* Long Island City 1, 47-28 37th St.
- \* Los Angeles 54, Ducommun Metals & Supply Co., 4890 S. Alameda
- \* Milwaukee 2, 111 E. Wisconsin Ave.
- \* Philadelphia 44, 18 W. Chelton Ave.
- \* Rochester 4, 16 Commercial St.

Here's another example of how Danly Precision Die Sets maintain close tolerance punch and die relationship on high production work.

The part illustrated, a nut chopper cutter, is produced on a 10-station progressive die at a rate of 7,200 pieces per hour. An average of 100,000 pieces are obtained between grinds. Tolerance of .001" between stations is maintained.

To date the same original Danly Die Set has held the tolerance required for a total of 1,500,000 pieces, and under normal operating conditions, will continue to give many more hours of profitable service.

**SEQUENCE OF OPERATIONS**—The roll stock is fed automatically through the following sequence of operations: (1) Pierce and notch right edge, (2) pilot, (3) notch left edge, (4) rough form center, (5) finish form center, (6) idle, (7) twist, (8) idle, (9) idle, (10) cut off.

**HELPFUL ENGINEERING SERVICE**—For helpful engineering service on Die Sets of any size, standard or special, for any type of press operation, consult Danly without obligation.

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Illustrates how you may use Danly's special machining and welding service to save additional time and money.



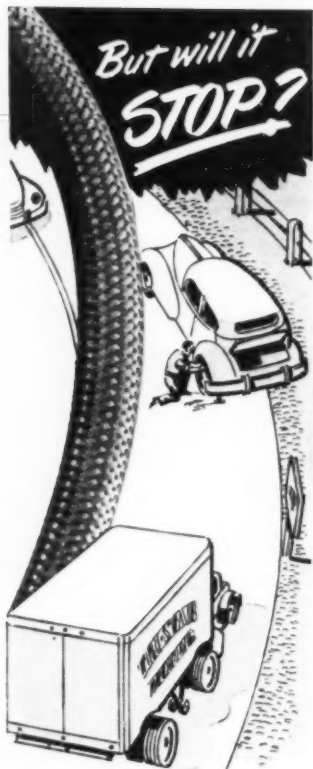
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## Warner Gear Expands

(Continued from page 25)

in the interest of maintaining exceptional quality control the bores are first drilled, then broached to size before being presented to the honing operation.

The company also makes extensive use of the Barnes-drill magnetic separator for continuous cleaning of the cutting fluid used on shaving machines and Micromatic hones. The device goes a long way to maintain clean cutting fluid free from chips and fine abrasive particles which would otherwise mar the finely finished surfaces.

A large battery of the well known Cincinnati centerless grinders is employed for the automatic grinding of shift rails and countershafts. Here they use three or four of the Centerless grinders tied together with a continuous through-feed magazine to effect the desired degree of surface finish and dimensional tolerances in a fully automatic cycle. Latest development is the installation of a new Landis centerless grinder at the end of one of the Cincinnati batteries for spot-grinding one end of the transmission countershaft. This Landis grinder marks the first production application of its kind the writer has noted. The machine has an automatic kick-out for unloading the work.

Every trick of the organization's skill is being employed to simplify the process and reduce costs without penalizing quality. One universal short cut is the use of air cylinders for locking work holding arbors on a variety of machines such as lathes, milling machines and gear hobbers. It is said that the application of the air cylinder on gear hobbers is quite unique.

Considering the extent and variety of advanced methods found at every turn in this plant, the few examples mentioned above should serve as a perspective of the general approach to the manufacturing problem. As mentioned earlier, the process of expansion and introduction of new equipment is continuing as a long-range program and will develop other items of outstanding interest as time goes on.

## Aircraft Workers In Big Demand

(Continued from page 54)

by lack of labor although shortages in various skills will now show up faster and in more areas. It also indicates that since the expansion has been coming about gradually, most employers have been looking ahead. Not only have they had time to plan but they are putting such plans into effect although there will always be spot difficulties here and there.



## Better Designed ... MORE RUGGEDLY BUILT!

There are some mighty good reasons why so many cities and industries use Layne Well Water Systems exclusively. Two of these reasons are:—finer design for higher efficiency and extra rugged construction to assure longer life.

Every part of a Layne Well Water System is severely tested for accuracy, strength and quality. Where strain is heaviest, extra strength has been added. To excessive points there is more toughness.

All in all your Layne Well Water Systems are as fine as modern skill and advanced engineering can create. Their reputation for extraordinarily satisfactory service under any and all conditions is world known.

If you are in need of more water, a Layne engineer may be called in without cost or obligation. For literature address LAYNE & BOWLER, INC. General Offices, Memphis 8, Tenn.

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AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. • Layne-Atlantic Co., Norfolk, Va. • Layne-Central Co., Memphis, Tenn. • Layne-Northern Co., Mishawaka, Ind. • Layne-Louisiana Co., Lake Charles, La. • Louisiana Well Co., Monroe, La. • Layne-New York Co., New York City • Layne-Northwest Co., Milwaukee, Wis. • Layne-Chicago Co., Chicago, Ill. • Layne-Pacific, Inc., Seattle, Wash. • Layne-Texas Co., Houston, Texas • Layne-Western Co., Kansas City, Mo. • Layne-Minnesota Co., Minneapolis, Minn. • International Water Corporation, Pittsburgh, Pa. • International Water Supply, Ltd., London, Ont., Can. • Layne-Hispano Americana, S. A., Mexico, D. F.

**BOWER BEARINGS ARE**

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**FOR GREATER DEPENDABILITY—LONGER LIFE**

Extra years of smooth, trouble-free performance are built into every Bower SPHER-O-HONED bearing. This premium of dependability, the result of important new design and engineering improvements, keeps maintenance costs down—increases efficiency.

Contacting roll ends and flange surfaces of Bower SPHER-O-HONED bearings are spherical *before the bearing is installed*. This greatly reduces initial wear and resultant "end play." The large Bower oil groove solves oil failure problems by carrying a continuous supply of lubricant to all vital working parts. And the hard surfaces of Bower bearings mean greater precision, better alignment, longer life.

Leading manufacturers of earthmoving equipment use Bower SPHER-O-HONED bearings. They've found—and you will too—that for all-around reliable performance they're your best bearing buy.

*For more complete information, write for the Bower Engineering catalog.*

**BOWER ROLLER BEARING COMPANY**  
DETROIT 14, MICHIGAN



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provide the newest and only outstanding improvement in Flexible Shaft Machinery in 25 years. It's another Strand step forward in quality precision tools for faster, easier and more economical production work. The Strandflex 4-Speed gear drive employs a patented, new type of quick change gear drive utilizing 4 POSITIVE speeds by a unique and easy method of instantly changing from one speed to another. Powered with totally enclosed ball bearing motors (having speeds from 850 to 9000 R.P.M., depending on motor) means years of smooth, trouble-free service. Send for Bulletin No. 43-A for full details.

Standard 3 speed counter shaft type Strand machines also available for portable rotary power at constant speeds for grinding, buffing, drilling, wire brushing and rotary filing, in all types and models from  $\frac{1}{8}$  to 3 H.P.—for every specific requirement. Send for Catalog No. 30.

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5001 NO. WOLCOTT AVE.  
CHICAGO 40, ILL.



### Automobile Hobby Group to Compile "Who's Who"

The Auto Maniacs of America, an automobile hobby group with headquarters in Detroit, has started compiling a directory of persons in the United States who have a keen interest in automobiles. Oliver E. Barthel, president of the organization, has requested that all persons desiring to be listed in the directory write to the executive secretary, Harold L. Mayer, Stockbridge, Mich. Hobbyists will be divided into three general groups: collectors of literature, name plates, parts and antique cars; amateur engineers; and those interested in all phases of automobile activity.

### Engineers Facing Bearing Lubrication Problems

Engineers designing journal bearings, particularly for gas turbines and high-speed supercharger drives, still face problems that lubrication theories cannot explain satisfactorily. Arvid E. Roach of GM's Research Laboratories told the annual meeting of the American Society of Mechanical Engineers recently in New York City. Mr. Roach's discussion of bearing lubrication problems was contained in a paper, "The Load-Carrying Ability of Hydrodynamic Oil Films," which was contributed by ASME's Special Research Committee on Lubrication and Petroleum Div.

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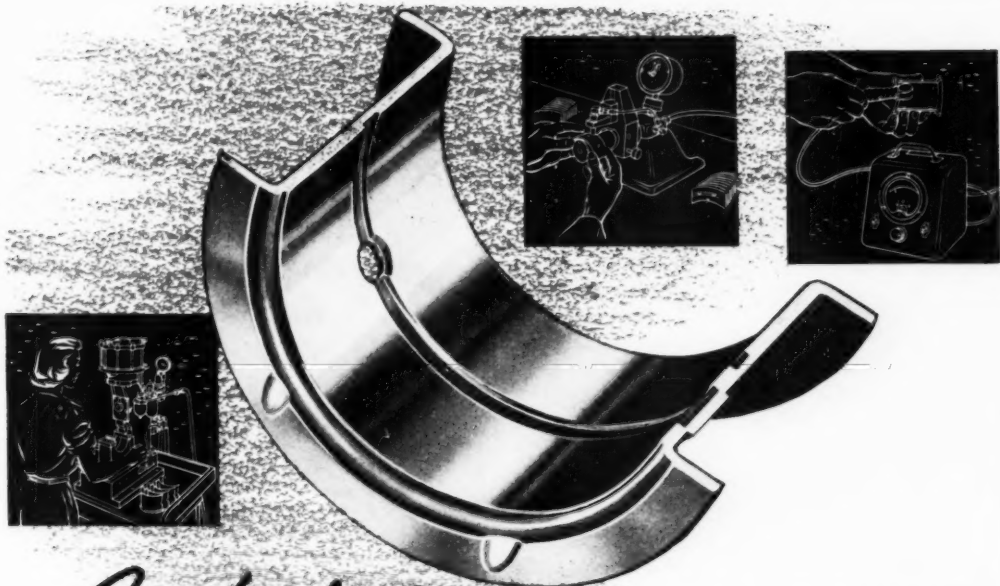
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# Combining PRODUCTION IN THE MILLIONS WITH QUALITY IN THE INDIVIDUAL BEARING

To assure top quality in mass production of sleeve bearings, at low cost, our Quality Control and Production Methods organization conducts as many as 108 separate tests for material quality and physical accuracy of the individual bearing. Specialists for almost 50 years, our six-plant organization is tailored to the peculiar needs of sleeve bearing production—from original research to field tests of the finished product. Our engineering department will gladly consult with you on your problems.

**28** PRECISE MACHINE OPERATIONS  
**84** MEASUREMENT CHECKS  
**24** ADDITIONAL TESTS

are conducted on a strip-type, copper-lead lined, steel-backed flanged bearing.



**HIGH SPEED**, high temperature, automotive type bearings available in many combinations.



**SPEED & LOAD** bearings for pumps, compressors, industrial electric motors and similar uses.



**HEAVY LOAD** for big Diesels, power plants, etc.—bearings up to 27½" O.D., steel and bronze back.



**BRONZE PARTS** in many shapes, sizes; thrust washers, bushings; for many types of applications.

Power goes to work smoothly through

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FEDERAL-MOGUL CORPORATION



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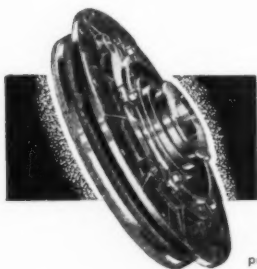
# Smoother Engagements

## protect these 14 Vital Points!



**NO GRAB!**  
**NO SHOCKS!**  
**NO JERKS!**

**LIPE**  
 TYPE ML  
**CLUTCH**



Saves wear and tear of vital gears, Drive Shaft, Axles, Universal Joints, Bearings. Reduces your maintenance costs. Keeps your vehicle more hours on the road . . . fewer hours in the shop.

Easier jockeying! The Lipe ML Clutch engages so smoothly that it gives your driver greater control over the vehicle. Does not jerk. Does not grab! Requires no babying! Result:

**Your Vehicle Handles Easier with LIPE!**

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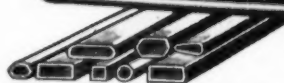


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Sizes  $\frac{1}{2}$ " O.D. to  $5\frac{1}{2}$ " O.D., 22 B.W.G. to 3 B.W.G.

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# Truarc inverted rings align shafts, save 20 minutes . . . \$1<sup>00</sup> per unit

Production savings and sales advantages result from redesign with four Truarc rings

- Eliminate two drilling, two tapping operations, and the fabrication of two collars and four pins.
- Eliminate two set screws.
- Cut dis-assembly, re-assembly time 75%.
- Make for closer tolerances.
- Make drive shaft self-aligning: operation by user greatly simplified.
- Make more delicate adjustments easier for user.
- Streamline entire unit.
- **TOTAL OVERALL SAVINGS, per unit . . . \$1.00**



Elevator-rod detail of Skyview Condenser Enlarger, where Truarc Inverted Retaining Rings provide uniform shoulder for abutting curved surface of helical spring. Improve product.



Like the Skyview Camera Company of Olmsted Falls, Ohio, re-design with Truarc and you will cut costs and improve your product too. Wherever you use machined collars, nuts, bolts, snap rings, cotter pins

—there's a Truarc ring that does a better job of holding parts together. All Waldes Truarc retaining rings are precision engineered, easy to assemble and dis-assemble, retain circularity always to give you a never-failing grip. They can be used over and over again. Send us your problem. Waldes Truarc engineers will be glad to show how Truarc can help you.



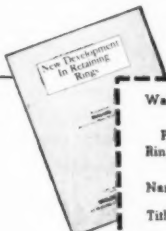
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Please send booklet, "New Development In Retaining Rings" to:

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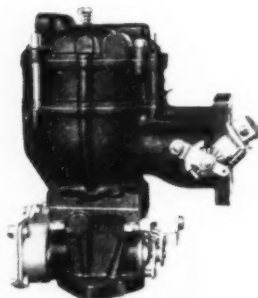


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that cuts **OPERATING COSTS**

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No one knows better than factory or maintenance engineers that economy is a long-range proposition—that if smoother, better all-around performance is assured, economy will inevitably follow. That is precisely why a large majority of engineers who know the problems of heavy-duty operation specify Zenith<sup>®</sup> carburetors for the job.

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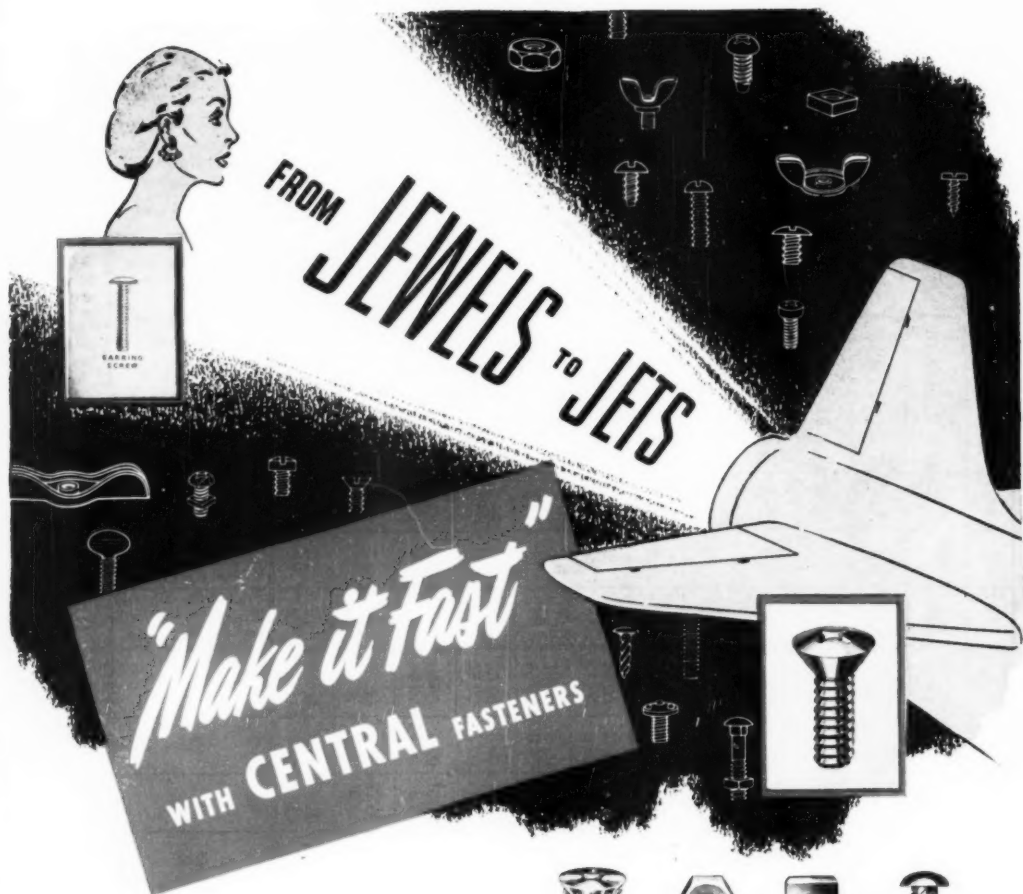


## BUNTING BRONZE BEARING ALLOYS

Bunting Alloy Number	PHYSICAL PROPERTIES										CHEMICAL COMPOSITION										Alloy Number																		
	Standard Stock		Order of Anti-Friction Property		Impact Value Charpy Test		Yield Strength Compressive Limit		Ultimate Strength Tensile		Yield Strength Tensile		Elongation Tension		Brinell Hardness 10 mm Ball—500 Kg Load		Rockwell—E Scale Hardness 1/8" Ball—100 Kg Load		Cu		Sn		Pb		Zn		Fe		Sb		Ni		P		Other Elements		SAE Equivalent	Similar Alloys	BUNTING Alloy Number
	158		1	2.9	13,000	20,000	10,000	8%	38	27	69.00	71.00	4.50	5.50	23.50	26.50	1.00	Max.	.20	.20	.20	.25	.05	.35													158		
			2	2.7	14,000	22,000	11,000	12%	40	32	73.00	77.00	4.00	5.00	18.00	23.00	1.00	Max.	.20	.20	.20	.25	.05														125		
	124		3	5.4	17,000	28,000	14,000	15%	50	52	84.00	86.00	4.50	5.50	8.00	10.00	1.50	Max.	.20	.20	.20	.25	.10														66		
	135		4	2.4	18,000	28,000	14,000	15%	52	55	75.00	79.00	7.00	9.00	13.00	17.00	1.00	Max.	.20	.20	.20	.25	.05														135		
		162	5	2.7	20,000	30,000	15,000	15%	55	59	69.00	73.00	8.50	9.50	17.50	22.50			.20	.20	.20	.25	.05	.25													162		
72			6	3.8	20,000	34,000	16,000	18%	58	63	81.00	85.00	6.50	7.50	6.00	8.00	2.00	4.00	.20	.20	.20	.35	.15	.20														660	
		27	7	2.6	21,000	35,000	17,000	18%	60	65	78.50	81.50	9.00	11.00	9.00	11.00	0.75	Max.	.20	.20	.20	.25	.10															27	
		147	9	5.6	17,000	35,000	17,000	15%	60	65	85.00	89.00	7.50	8.50	.75	1.50	2.25	4.25	.20	.20	.20		.05	.25														147	
96			8	5.8	22,000	40,000	18,000	20%	65	70	86.00	89.00	9.00	11.00	2.00	3.00	1.00	Max.	.20	.20	.20	.25	.10														63		
	98		10	3.7	22,000	40,000	18,000	20%	65	70	86.00	89.00	9.00	11.00	0.35	1.00	3.00	3.00	.06	.20	.20	.25	.10														62		
	156		11	1.7	22,000	40,000	18,000	20%	67	72	83.00	90.00	10.00	12.00	0.50	Max.	0.50	Max.					.10	.30													65		
164			12	2.7	23,000	40,000	18,000	20%	70	75	85.25	87.75	10.00	12.00	1.00	1.50			.30	.20	.20	.75	.30	.25													164		
		143	13	0.8	24,000	40,000	18,000	10%	76	80	84.00	86.00	13.50	14.50	1.50	Max.	0.25	Max.	.20	.20			.10	.25														143	

● This is the alloy page from the paper, "Cast Bronze Bearing Alloys". We will send you the complete paper on request.

THE BUNTING BRASS & BRONZE COMPANY, TOLEDO 9, OHIO  
BRANCHES IN PRINCIPAL CITIES



From tiny earring screws that secure milady's jewels, ranging up to heat and torque resistant aircraft fasteners, Central is a leading producer. "Centralize" your fastening purchases at this 2-plant source. Take advantage of Central's *hi-speed* service and scientific "Fasteneering" which simplifies designs for attractive savings along your production lines.

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"You Can Depend on Central!"

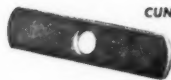
# *A greatly improved speedometer* by KING-SEELEY



OLD  
TYPE MAGNET



NEW,  
CUNIFE MAGNET



The performance, dependability and service life of an automotive speedometer depends primarily on its permanent magnet and the ability of that magnet to retain its initial strength under all operating conditions.

A new and much superior magnet is now being used exclusively in King-Seeley speedometers. It is made of Cunife, a very powerful magnetic material having unusual physical properties which has made possible an instrument of greater accuracy, dependability and longer life.

Specifically, this new Cunife magnet provides 30% more force with only two-thirds of the weight of the previous magnet. The new material has reduced bearing load 50% and is 750% more stable. It is far more resistant to temperature variations, vibration, shock and the effects of stray magnetic fields.

This is another result of King-Seeley's continuing research program which has for many years led the march of progress in the field of automotive instruments.

5038

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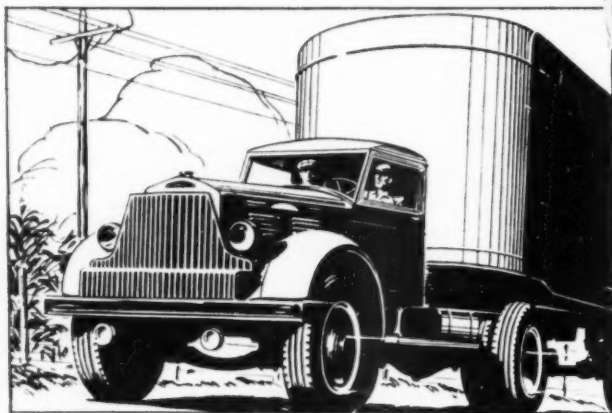
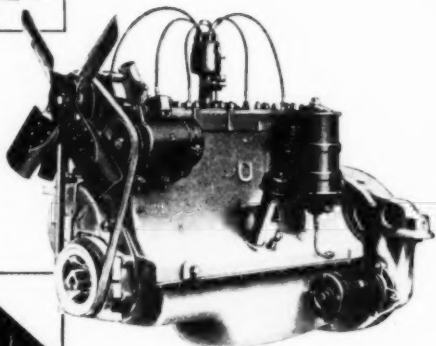
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### ON TIME with Red Seal Power

Whether it's a matter of getting the kids to school by the first bell, or operating transcontinental on-time schedules, there are buses powered with Red Seal engines that will do the job better — at lower cost.

New Red Seal engines, completely post-war in design, are delivering more horsepower per pound, with typical Red Seal reliability and economy. When you are specifying transportation equipment, it will be worth your while to consider units powered by Red Seal engines.



### RED SEAL M-330 . . . a revolutionary engine!

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***Continental Motors Corporation***  
MUSKEGON, MICHIGAN

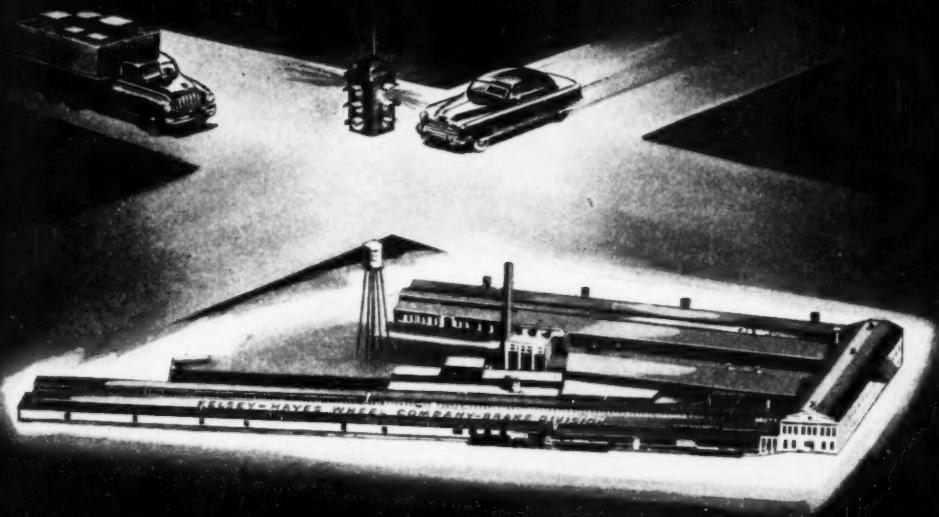
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*World Famous  
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ASSURES PROVEN PRODUCTS AT

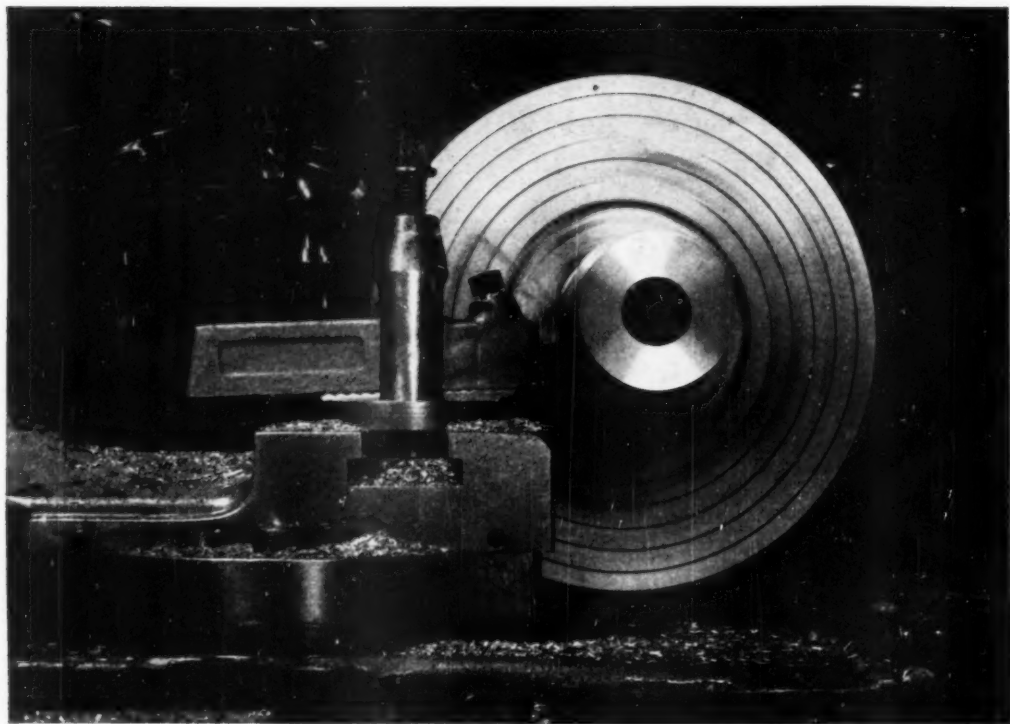
**KELSEY-HAYES WHEEL COMPANY**  
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Wheels—Hub and Drum Assemblies—Brakes—"Vacdraulic" Brake Power Units—for Passenger Cars, Trucks, Buses—made by Kelsey-Hayes' Michigan Plants and Windsor-Canada Plant • "Hydraulic" Electric Brakes • "Luhon" Vacuum Power Brake Equipment for Tractor-Trailers—made by Kelsey-Hayes' South San Francisco-Lathrop Plant • Wheels—Hubs—Axles—Parts for Farm Implements—made by Kelsey-Hayes' French & Hocht Plant at Orlanport, Iowa

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Chicago and

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# SEVEN HEADS ARE BETTER THAN ONE . . . . .



. . . . especially when it's *your* spring those heads are concentrating on. Whether it's a matter of material, design, method of manufacture or deliveries, it's to your advantage to know that the best skills in the craft are instantly ready for group consultation and action.

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... AND DUNBAR BROTHERS COMPANY DIVISION, BRISTOL, CONN.  
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Bearings of high purity tin-base XXXX NICKEL conform readily to irregular shafting . . . running-in problems are negligible. Operating breakdowns are minimized, too, because bearings made of this alloy function properly even when lubrication fails momentarily.

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Federated produces many other nationally known babbitts, including "Thermodyne," "Merit" and "Record." See Federated first, too, for ingot metals, solders, type metals, die casting metals and fabricated lead products.

For easy-to-read bearing-metal literature, address Dept. SJ at Federated's New York office. To order, call or write any of Federated's 11 plants and 25 sales offices across the nation.



# Federated METALS

Division of American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.



# Look! It's a Cinch!



## Installation cost is way down and weatherproofing is permanent

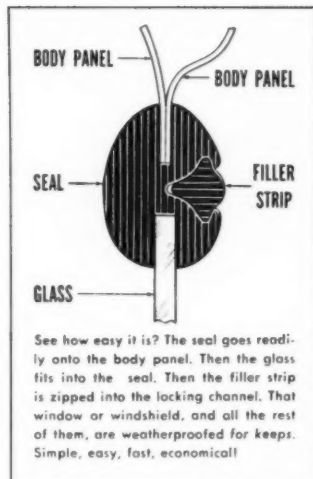
Costwise, there's almost no comparison—between ordinary sealing of windows and windshields, and the amazingly fast installation of Inland Self-Sealing Weather Strip.

The ordinary way calls for two men usually, and for much time spent in preparation, sub-assembly, reworking and cleanup. It's a very costly operation at best.

But not the Inland way. No cement

is used. The Inland seal goes quickly and easily on the body-panel opening—the glass slips into the channel in the seal—and the exclusive Inland Filler Strip feeds zipperwise, and fast, into the locking channel.

It's permanent weather-sealing, leak-proof under the most severe conditions. A one-time, one-man job, at lowest first cost, and with no reoperation cost! Write today for details.

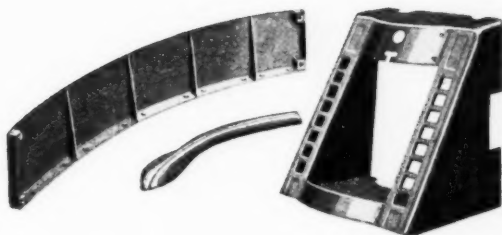
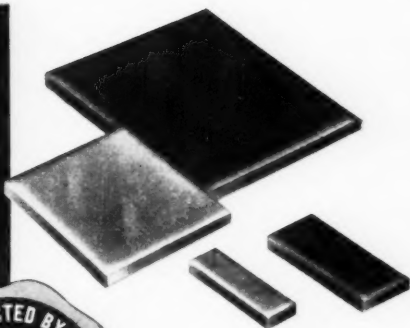
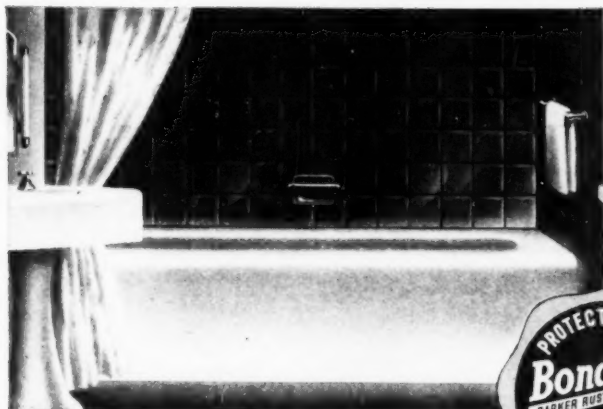


INLAND MANUFACTURING DIVISION  
GENERAL MOTORS CORPORATION DAYTON, OHIO



## Self-Sealing Weather Strip

(PATENTED)



## *Bonderite is Right* for aluminum...

You, too, can have the advantages of Bonderizing on your aluminum! You can have assured, lasting paint adhesion, protection from corrosion and oxidation, and prevention of peeling and chipping.

Bonderizing for aluminum is effective, economical, quick, and simple. On sheets or castings of this metal and its alloys, the Bonderite crystals form a tight nonmetallic phosphate coating which becomes part of the metal itself. Paint finish, applied over Bonderizing, is there to stay, and retains its fine appearance through years of hard service.

The same line that Bonderizes your aluminum may be used for mixed production, protecting and preparing zinc and steel parts for paint, too.

Your aluminum products deserve the appearance and service protection of Bonderizing. Get full information now!

### SEND FOR TECHNICAL BULLETIN!

Get details on Bonderizing for aluminum. Write today for free technical bulletins.



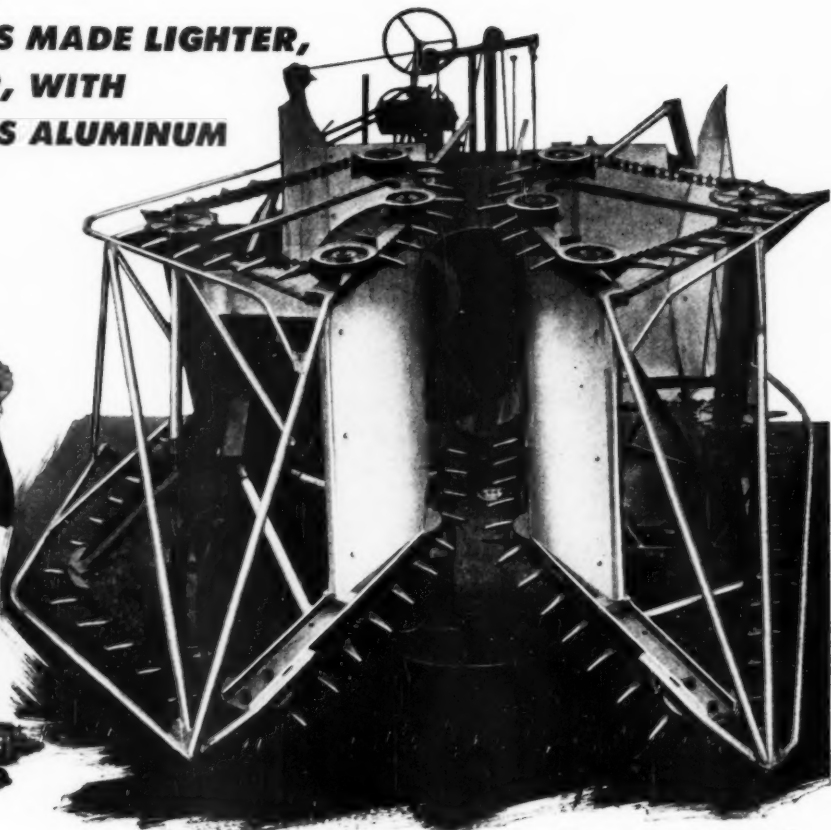
*Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.*

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**PARKER RUST PROOF COMPANY**  
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**MACHINES MADE LIGHTER,  
MIGHTIER, WITH  
REYNOLDS ALUMINUM**



*Photo courtesy Thomson Machinery Co., Thibodaux, La.*

**M**UCH of the cost of raising sugar cane is in the cutting. The cane harvester in the picture above used to be overweight, had trouble getting over wet ground until aluminum replaced many heavy parts.

The manufacturer redesigned with aluminum—used aluminum bar and structurals in the frame work, replaced cast iron gear cases with strong, heat-treated aluminum castings. In fact, nearly 30% reduction of dead weight was made without sacrifice of strength. This allowed more engine—30 hp was added—never attainable with heavier metals. Now more cane is cut faster and harvest costs are lower, because lighter aluminum enabled the making of a mightier machine.

Here's proof of the part aluminum can play in improving your product. There are many kinds of aluminum that do many different jobs, better. Aluminum lets you forget rust, gives you a metal that's easier and faster to handle;

it's strong even though  $\frac{1}{3}$  the weight of other metal. You can save on finishing cost—aluminum's bright natural finish stays bright. Shipping costs are less and sales appeal is tops. You can have all these benefits in extrusions, structurals, sheet, screw machine stock, wire, rod, bar and special shapes—in a wide range of alloys and tempers.

To get the lift of aluminum for your product, get the help of Reynolds experienced technicians. Call the nearest Reynolds Office, listed under "Aluminum" in the classified section of your telephone directory, or write to Reynolds Metals Company, Aluminum Division, 2513 South Third Street, Louisville 1, Kentucky.



*As a result of Reynolds becoming a primary producer, the base price of aluminum is now 20% below prewar levels.*



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*Lifetime* **ALUMINUM**

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THEY'RE

**OUTSTANDING...**



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"UNBRAKO"  
SOCKET SET  
SCREW WITH  
KNURLED CUP  
POINT



"WON'T SHAKE LOOSE"

The Knurled Cup Point of this "Unbrako" makes it a Self-Locker, because the keen edges of the knurls screwed home tightly, positively prevent creep,—even when subjected to the most chattering vibration. Pat'd. and Pats. Pend.

"UNBRAKO"  
SOCKET SET  
SCREW WITH  
KNURLED THREADS



"WON'T SHAKE LOOSE"

The knurled swaged threads make this screw a Self-Locker, too, for Flat, Cone, Oval, Half and Full Dog Points which cannot be knurled . . . or for hardened steel shaft where knurled cup point cannot be used. Pat'd.

## SOCKET SCREW PRODUCTS

The "Unbrako" Internal Wrenching Bolt (A), and the 100' Flush Head Socket Bolt (B), are practically "musts" in the Aviation Field . . . they so exactly meet the requirements of precision, tensile fatigue and other stringent requisites of Aviation Engineering. And the other popularly acclaimed "Unbrako" Products, pictured below, have proved themselves throughout Industry for years as absolutely dependable.

Write us for the name and address of your nearest "Unbrako" Industrial Distributor and for your copy of the "Unbrako" Catalog.

"UNBRAKO"  
KNURLED SOCKET  
HEAD CAP SCREW



The knurled head of this "Unbrako" provides a slip-proof grip, though the fingers and head be ever so oily, therefore, it can be screwed-in faster and farther before it becomes necessary to use a wrench.

"HALLOWELL"  
KEY KIT



KITS: PATS. PEND.

You can't tighten or loosen socket screws without a hex socket wrench, so why not get our No. 25 or No. 50 "Hallowell" Hallow Handle Key Kit which contains most all hex socket bits.

"FLEXLOC"  
SELF-LOCKING NUTS



"WON'T SHAKE LOOSE"

Because it is one-piece, all-metal, full-thread and resilient . . . and, because it is a rugged "Stop," "Lock," and "Plain" nut all in one,—processed to have an exceptionally uniform torque and long life,—the "Flexloc" is becoming widely accepted. Request samples. Pat'd. & Pats. Pend.

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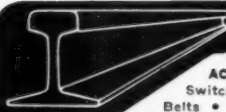


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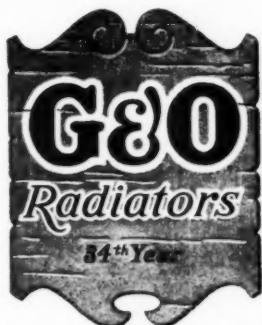
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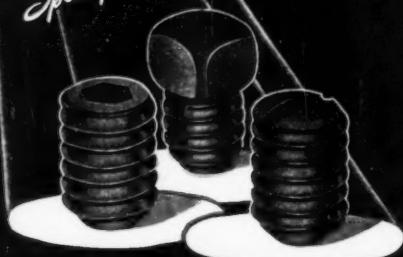
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Aetna Ball & Roller Bearing Co.	73	Chicago Rawhide Mfg. Co.	79	General Electric Company	—
Ajax Manufacturing Co.	—	Cincinnati Milling Machine Co.	16	Gibson Co., Wm. D.	100
Allied Products Corp.	—	Cincinnati Tool Co., The	80	Gisholt Machine Co.	8
Allison Co., The	—	Clark Equipment Co.	—	Globe-Union, Inc.	—
Aluminum Co. of Amer.	—	Clearing Machine Corp.	—	Goodrich Chemical Co., B. F.	—
Aluminum Industries, Inc.	—	Cleveland Punch & Shear Wks., Co.	—	Grant Lark Steel Corp.	—
American Bosch Corp.	—	Clifford Manufacturing Co.	—	Greenlee Bros. & Co.	—
American Brake Shoe Co.	—	Columbia Steel Co.	—	Gunite Foundries	70
American Broach & Machine Co.	—	Commander Mfg. Co.	—		
American Chain & Cable Co., Inc.	—	Continental - Diamond Fibre Co.	—		
American Chemical Paint Co.	—	Continental Motors Corp.	96	Handy & Harman	—
American Electric Fusion Corp.	—	Continental Screw Co.	71	Hannifin Corp.	106
American Screw Co.	13-71	Continental Tool Works	—	Hanson-Van Winkle-Munning Co.	—
Armstrong Cork & Wire Co.	—	Corbin Screw Div.	71	Harper Co., The H. M.	71
Aro Equipment Corp., The	—	Cotta Transmission Co.	1		
Associated Spring Corp.	100	Cross Company, The	12		
Auto-Lite Battery Corporation	—				
Automatic Transportation Co.	—	Danly Machine Specialties, Inc.	83		
Automotive & Aircraft Div., Amer. Chain & Cable Co.	—	Detrex Corporation	—		
Automotive Gear Works, Inc.	—	Disston & Sons, Inc., Henry	—		
		Dole Valve Co., The	—		
		Donaldson Co., The	—		
		Dow Corning Corp.	—		
		Dunbar Brothers Co. Div.	100		
		du Pont de Nemours & Co., Inc., E. I.	—		
		Dykem Co., The	106		
		Dynamatic Corp., Sub. Eaton Mfg. Co.	—		
Bakelite Corp.	—	Eaton Manufacturing Co.	—	Heald Machine Co., The	—
Barber-Colman Co.	—	Eleo Tool & Screw Corp.	71	Herbrand Division, The Birmingham-Herbrand Corp.	—
Barnes Corp., John S.	—	Electric Auto-Lite Co., The	—	Hoover Ball & Roller Bearing Co.	67
Barnes Co., Wallace	100	Electric Furnace Co., The	—	Houdt Engineering Div.	—
Barnes Drill Co.	—	Electric Storage Battery Co.	10	Houghton & Co., E. F.	—
Barnes-Gibson-Raymond	100	Electro-Alloys Div.	—	Howell Electric Motors Co.	—
Bath Co., Cyril	—	Elwell-Parker Electric Co.	—	Hyatt Bearings Div.	—
Bearing Co. of Amer.	—	Essex Wire Corp.	—		
Bendix Aviation Corporation	—	Ethyl Corporation	76-77		
Bendix Products Div.	14	Ex-Cell-O Corp.	11		
Eclipse Machine Div.	—	Excelsior Leather Washer Mfg. Co., Inc.	—		
Scintilla Magneto Div.	—				
Stromberg-Elmira Div.	—				
Zenith Carburetor Div.	92				
Bendix-Westinghouse Automotive Air Brake Co.	—				
Besly and Co., Chas. H.	106				
Bethlehem Steel Co.	98				
Black & Decker Mfg. Co.	—				
Blakeslee & Co., G. S.	78				
Bliss Co., E. W.	—				
Borg & Beck Div., Borg Warner	—				
Bower Roller Bearing Co.	85				
Box 57	106				
Brad-Foote Gear Works	—				
Brown Instrument Co., The	—	Fairfield Mfg. Co.	—	Illinois Coil Spring Co.	—
Buell Manufacturing Co.	—	Fansteel Metallurgical Corp.	—	Ingersoll-Rand	—
Builders Steel Supply Co.	106	Fasco Industries, Inc.	—	Inland Manufacturing Div.	102
Bullard Company	—	Federal-Mogul Corp.	87	Inland Steel Company	—
Bundy Tubing Company	—	Federated Metals Div.	101	International Nickel Co., Inc.	2
Bunting Brass & Bronze Co.	93	Felters Co., The	—		
		Fitzgerald Mfg. Co., The	86		
		Foote Bros. Gear & Machine Corp.	—	Johnson Bronze Co.	—
		Ford Motor Co.	—	Johnson-Green, Inc.	—
		Fuller Manufacturing Co.	—	Johnson Products, Inc.	—
				Jones & Laughlin Steel Corp.	9
Camecar Products Co.	71				
Campbell, Wyant & Cannon Foundry Co.	75				
Carboloy Company, Inc.	—				
Carnegie-Illinois Steel Corp.	—	G & O Mfg. Co., The	107	Kelsey-Hayes Wheel Co.	97
Central Screw Co.	71-94	Gairing Tool Co., The	—	Kent-Owens Machine Co.	—
		Galland-Henning Mfg. Co.	—	Kester Solder Co.	—
				King-Seeley Corp.	95

## Index to

The Advertisers' Index is published of the advertising contract. Every rectly. No allowance will be made

Magnaflux Corp. ....	—
Mahon Co., The R. C. ....	7
Mallory & Co., Inc., P. R. ....	—
Mattison Machine Works. ....	—

as a convenience, and not as part  
care will be taken to index cor-  
for errors or failure to insert.

Mechanics Universal Joint Div.	—
Merz Engineering Co.	—
Michigan Steel Tube Products Co.	—
Micromatic Hone Corp.	68
Midland Steel Products Co.	—
Milford Rivet & Machine Co.	71
Milisco Manufacturing Co.	110
Moline Tool Company	—
Moore, Inc., George W.	107
Moraine Products Div.	—
Muskegon Piston Ring Co.	—

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CRANES

BULL-DOZERS

SCRAPERS

ROAD MACHINERY

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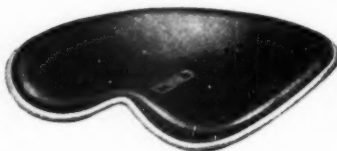
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... a seat designed to give the operator exceptional comfort and ample leg room. Frame is made of heavy steel tubing. Removable cushion is padded with FOAM RUBBER, with a choice of covering materials. Complete with padded backrest.



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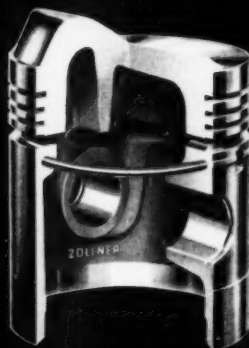
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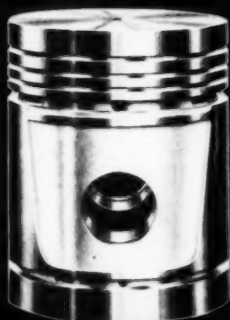

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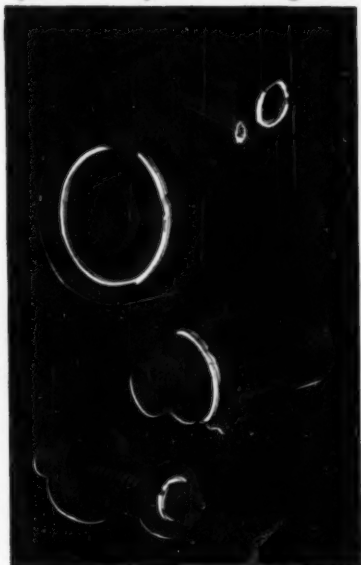
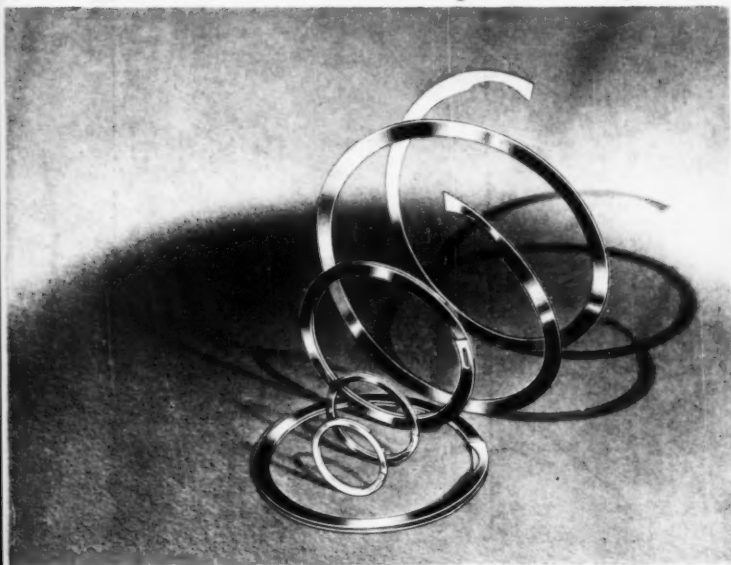
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